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Northcentral Montana Cooperative Westslope Cutthroat Trout Restoration Project

2004 Annual Report

David Moser; Montana Dept. Fish Wildlife & Parks, Great Falls
Anne Tews; Montana Dept. Fish Wildlife & Parks, Lewistown
Michael Enk; United States Forest Service, Great Falls

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ABSTRACT

There has been little change in the total miles of stream in northcentral Montana which support pure westslope cutthroat trout (WCT) populations or number of pure populations since 2003 (141 miles and 58 populations in 2003 and 142 miles and 60 populations in 2004). The largest decrease in miles of stream from 2003 to 2004 with pure cutthroat was in the Belt Drainage (44 to 37 miles). This decrease is primarily attributable to surveys in the Tillinghast Drainage that revealed rainbows and highly hybridized fish dominated headwater reaches. In 2004, losses of populations because of new genetic information have been offset by discoveries of new populations (e.g. Palisades Creek and Crawford Creek; Belt Drainage) and establishment of new populations in previously empty headwater habitats (N. Fk. Ford Creek; Sun Drainage and Cottonwood Creek; Judith Drainage). Drought and catastrophic events such as fire have the potential to rapidly negatively affect WCT numbers in northcentral Montana. In the absence of catastrophic events, restoration projects appear to be maintaining the current range of WCT in northcentral Montana.

In 2004, non-native fishes were suppressed in several reservoirs and streams supporting extant populations of WCT. Efforts included removal of white suckers in Three Mile Creek Reservoir (Upper Missouri), suppression of eastern brook trout (EB) in Cottonwood Creek (Beartooth Game Range), suppression of EB on Big Coulee Creek and Middle Fork Little Belt Creek (Highwood Mountains), suppression of EB in Tyrell and Pole Creeks (Smith Drainage) and eradication/suppression of EB in Cottonwood Creek (Arrow Drainage). Electrofishing equipment was used for all EB suppression efforts.

Pure WCT were transferred from East Fork Spring Creek (Judith Drainage; Snowy Mountains) to a previously fishless area (≈1.5 miles) of North Fork Ford Creek (Sun Drainage; Rocky Mountain Front). WCT were transferred from a tributary to West Fork Cottonwood Creek (Judith Drainage; Snowy Mountains) to previously fishless habitat (≈1.5 miles) above a series of barriers in West Fork Cottonwood Creek (Snowy Mountains). Enhancement was made to a man made falls barrier with additional blasting on Big Coulee Creek (Highwood Creek Drainage). The barrier on Big Coulee Creek should now be impassable to fishes at most flows. A failing culvert on Middle Fork Little Belt Creek was replaced with a culvert designed to be a barrier. The new culvert on Middle Fork Little Belt Creek protects a small (1 mile) population of pure WCT. Additional data was collected from numerous other streams throughout northcentral Montana in 2004. Data collected included, genetic samples (whole fish and DNA samples), temperature, conductivity, invertebrate samples, estimates of population abundance, and habitat quantity/quality.

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INTRODUCTION

Westslope cutthroat trout (WCT) were first described by Lewis and Clark in 1805 near Great Falls, Montana. WCT are recognized as one of 14 interior subspecies of cutthroat trout and are found in Alberta, Idaho, Washington, and Montana. In Montana, WCT occupy the Upper Missouri River drainages east of the Continental Divide and the Upper Columbia Basin west of the divide (Behnke 1992). Although still widespread, WCT distribution and numbers have declined significantly in the past 100 years due to a variety of causes, including loss of habitat, competition and predation from non-native fish species, and hybridization (Shepard et al. 2003, Shepard et al. 1997, McIntyre and Rieman 1995, Liknes 1984, Hanzel 1959). Genetically unaltered WCT currently occupy approximately 8% of their historic habitat across their entire range (Shepard et al. 2003).

The marked decrease in WCT density and distribution led to them being listed in 1972 as a State Species of Special Concern by the Montana Department of Fish, Wildlife and Parks (MFWP). WCT were petitioned for listing as threatened under the federal Endangered Species Act in June 1997.

The state of Montana developed a statewide WCT Conservation Agreement in 1999, with the help of a technical committee formed in 1994 and a steering committee formed in 1996. The Conservation Agreement was signed by several state and federal agencies as well as some non-government organizations. In 2000, a document was developed which described the status and restoration strategies (SRS) necessary for restoration of WCT in northcentral Montana (Tews et al. 2000). The strategies in the SRS were based on goals and objectives developed in the Conservation Agreement.

Strategies for restoration of WCT in northcentral Montana outlined in the 2000 SRS included: 1) preservation of all existing pure populations, 2) creation of two large populations (>50 miles of stream) as proposed in the conservation agreement, and 3) establishment of 2 to 4 additional secure viable populations (minimum of 2,500 individuals) each, in the Southern Tributaries and the East Front. Tools available to implement these strategies include, creation of new barriers to protect pure populations, removal or eradication of non-native species, and replication of existing pure populations in either empty headwater habitats or habitats made empty through application of piscicides.

In April of 2000, following an extensive status review, the U.S. Fish and Wildlife Service (USFWS) determined that westslope cutthroat trout were “not warranted” for federal listing. That finding was challenged in federal court, and the court remanded the not warranted finding back to the USFWS for additional review. In 2003, after additional review, the USFWS determined that WCT are not likely to become a threatened or endangered species in the foreseeable future, therefore listing was not warranted. The second finding of “not warranted” is again being challenged in federal court.

In 2001, a challenge cost share agreement was established between MFWP and the United States Forest Service (USFS). The agreement was formed to help implement new restoration efforts for WCT in northcentral Montana and coordinate existing efforts described in the SRS. The Wildlife Conservation and Restoration Program (WCRP) and the State Wildlife Grants (SWG) programs were established to provide states with federal aid funding to conserve declining fish and wildlife and their habitats. These programs provided funding in 2002, 2003, and 2004. PPL Montana provided funding for a fish and wildlife technician in 2003 and 2004. This report and much of the WCT restoration work it includes is a direct result of funding from these programs.

This report describes the status of WCT in northcentral Montana relative to the status of WCT in 2000 (SRS) and presents data on individual streams organized by fourth code HUC drainages (Hydrologic Unit Codes (HUC) are eight digit codes used to catalog watersheds).

STUDY AREA

The general study area includes the following major drainages: Arrow, Belt, Judith, Musselshell, Smith, Sun, Teton, Two Medicine, and Upper Missouri. These drainages are found within MFWP Region 4 and most WCT populations are located on National Forest Lands within Lewis and Clark and Helena National Forests (Figure 1).

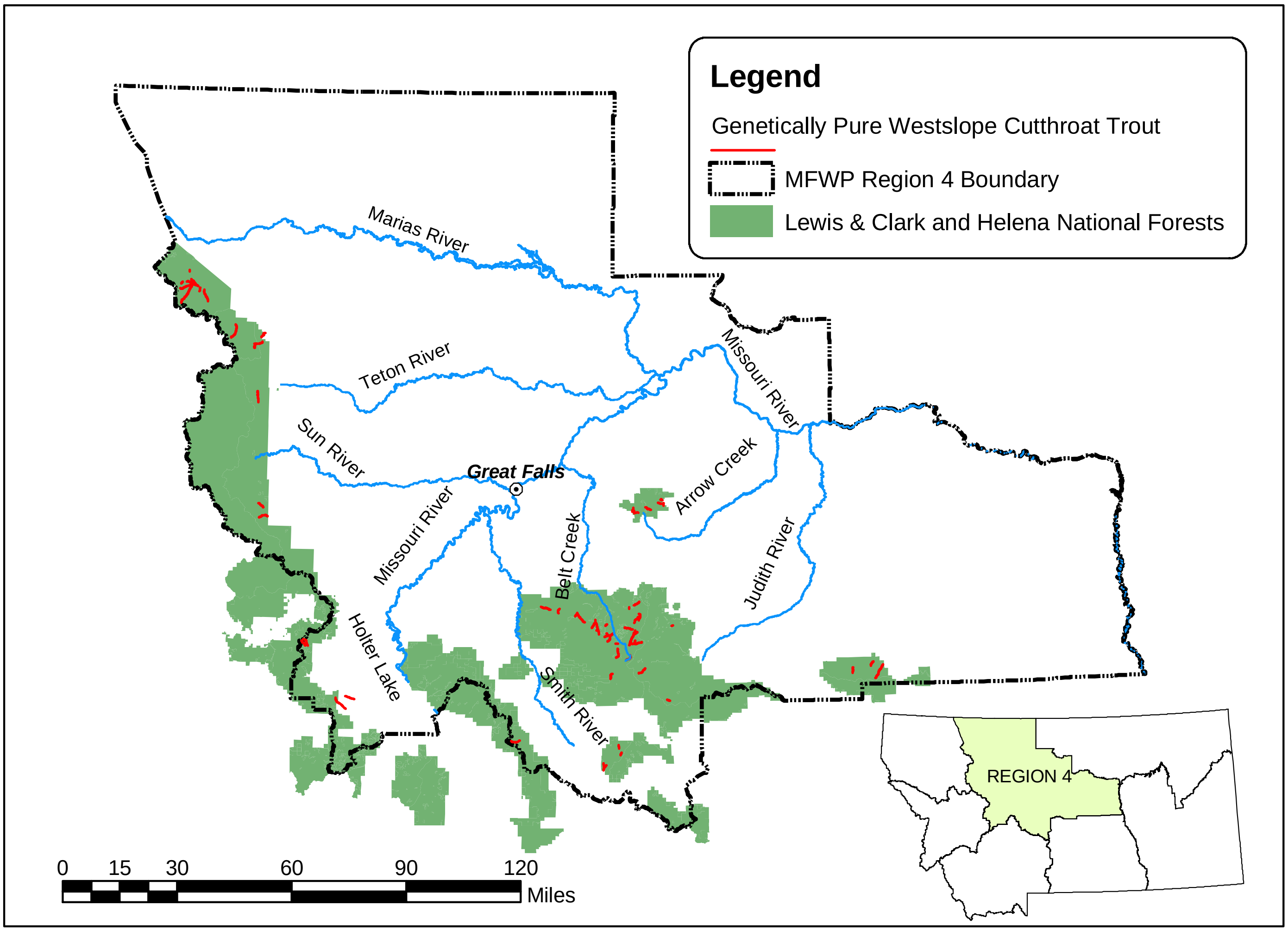

Figure 1. Study area in northcentral Montana with 100% pure WCT populations.

PROCEDURES

Fish populations were sampled with a Smith Root Model™ 12-A, 12-B, and LR-24 battery powered backpack electrofishing unit. Population estimates followed the methods of Leathe (1983). On larger streams, such as the Middle Fork Judith, two backpack units were used side by side to increase electrofishing efficiency. When the probability of capture during the second pass was less than 0.8, additional passes were usually made to reduce underestimates of trout population size as described by Riley and Fausch (1992).

Small streams were electrofished in either an upstream direction or downstream direction with a block net at the downstream end. Depletion estimates were calculated using Microfish 3.0 (Van Deventer and Platts 1985). Trout populations in the Teton River were surveyed using a small johnboat equipped with a mobile electrode and a Coffelt™ VVP to rectify AC to DC. Power was obtained from a 240 volt generator. Tissue from the caudal fins of trout were used for polymerase chain reaction (PCR) amplification of paired interspersed nuclear DNA elements (PINES) analysis and preserved in 95% ethanol. Adipose fins were clipped on trout that were sampled for PINES genetics. For samples taken from the South Fork Judith River, whole trout were frozen for analysis. Fish were measured to the nearest 0.1 inch or 1 mm. On some streams, temperature was recorded every 1 - 2 hours with Onset continuous recording data loggers and is presented as average daily temperature (Appendix 1 and 2). Specific conductivity/TDS was measured with a temperature compensated Oakton TDSTestr3, TDSTestr1, or ECTestr with a range of 0 - 1990 μS/cm. Fish lengths, sampled stream lengths, and temperature are presented in metric. Other measures are presented in English units for clarity (e.g. miles of stream, cubic feet per second)

RESULTS AND DISCUSSION

Revision of WCT Distribution in Central Montana

Information within the 2000 SRS was used to guide restoration efforts over the last four years and provides a context with which to judge recent WCT restoration and protection efforts in northcentral Montana. It is important to stress that the purity and range of WCT populations described in the 2000 SRS was developed through professional judgment based on temporally and spatially limited sampling information. Moreover, estimated miles were in many cases developed by local biologists using maps and limited ground-truthing. The following results are presented as a rough estimate of WCT restoration progress in central Montana since 2000 (baseline): it is not intended as a precise accounting of miles or purity.

There has been little change in the total miles of stream in northcentral Montana which support pure WCT populations or number of pure populations since 2003 (141 miles and 58 populations in 2003 and 142 miles and 60 populations in 2004). The largest decrease in miles of stream from 2003 to 2004 with pure cutthroat was in the Belt Drainage (44 to 37 miles; Table 1; Figure 2). This decrease is primarily attributable to surveys in the Tillinghast Drainage that revealed rainbows and highly hybridized fish dominated headwater reaches. In 2004, losses of populations because of new genetic information (Appendix 3) have been offset by discoveries of new populations (e.g. Palisades Creek and Crawford Creek; Belt Drainage; Appendix 4) and establishment of new populations in previously empty headwater habitats (N. Fk. Ford Creek; Sun Drainage and Cottonwood Creek; Judith Drainage; Appendix 4). Appendices 3 through 6 show specifics related to changes in miles of stream and number of populations of pure WCT. Drought and catastrophic events such as fire have the potential to rapidly negatively affect WCT numbers in northcentral Montana. In the absence of catastrophic events, restoration projects appear to be maintaining the current range of WCT in northcentral Montana. In the future, larger projects which incorporate large drainage areas (>25 miles) will be necessary to significantly increase the current range of WCT and insure long term persistence (>100 years).

Most of the major changes in status of local populations in 2004 are described and listed in Appendix 4, these include: changes because of new information from upstream sites, adjustments in map distance, distance changes because of new genetic data, successful transfers (replication) of populations to empty habitats, and newly discovered pure populations. In addition, more textual detail is provided in the summary of survey and restoration efforts forthwith.

Table 1. Distribution of WCT, rainbow trout and brook trout (stream miles) in northcentral Montana. Number of populations in parentheses (Tews et. al 2000; updated January 2004).

Drainage	**Estimated miles of suitable historic habitat for WCT** [1]	**% of historic habitat occupied by genetically pure WCT**	**Miles of stream occupied by genetically pure WCT (# of pops.)** [2]		**Miles of stream occupied by 90-99.9% pure WCT (# of pops.)** [2]		**Miles of stream occupied by less than 90% pure WCT (# of pops.)** [3]		**Miles of stream occupied by brook trout** [4]	**Miles of stream occupied by rainbow trout** [4]	**Total stream miles in drainage** [5]
Upper Missouri	1,199	1%	12	(4)	3	(1)	16	(4)	802	992	2,200
Shonkin	21	0%							21	14	
Highwood	55	4%	2	(1)			1	(1)	55*	44	
Smith	741	3%	18	(9)	23	(8)	37	(10)	691	516	2,858
Sun	365	1%	5	(2)	9	(5)	5	(1)	362	461	2,404
Belt	249	15%	37	(19)	61	(16)	8	(5)	211*	197	800
Teton	335	2%	6	(3)	25	(9)			329	194	1,751
Two Medicine	267	16%	37	(10)	39	(13)	12	(4)	240	194	1,422
Cutbank Cr.	23	0%							0	23	1,089
Marias	150	0%							0	150	2,494
Arrow	47	6%	3	(2)					47*	34	1,336
Judith	480	2%	7	(4)	50	(15)	17	(7)	304	409	3,223
Upper Musselshell									262	198	4,676
Box Elder	94	2%	2	(1)					0	94	891
Flatwillow	122	4%	5	(1)					122	98	1,372
Total Region 4	4,148	3%	132	(56)	208	(67)	96	(32)	3,446	3,618	26,516
Total Region 4 (2000 SRS)	4,148	5%	194	(72)	168	(43)	66	(20)	3,446	3,618	26,516

[1] suitable habitat based on current rainbow and brook trout distribution in the historical WCT range (Steve Carson, MFWP, Montana Rivers Information System)

[2] calculated from USFS and MFWP data files. Number of populations may vary slightly due to questions about where one population ends and another begins; updated 2003.

[3] genetically tested populations, 100's of more miles likely exist that are hybridized but have not been tested;

[4] miles from Montana Rivers Information System (Steve Carson, MFWP) and includes areas that were likely not historic habitat

[5] total drainage miles from Conservation Agreement (MFWP 1999), this number includes stream reaches that have not been surveyed, including areas that will not support trout

* Miles of stream occupied by brook trout have decreased slightly in three drainages where barriers have been built and electrofishing has been used as a tool for eradication. Streams where EB have been removed completely or substantially depressed: Big Coulee (≈2 miles; Highwood), Cottonwood Creek (≈2 miles; Arrow), Chamberlain Creek (≈1 mile; Belt).

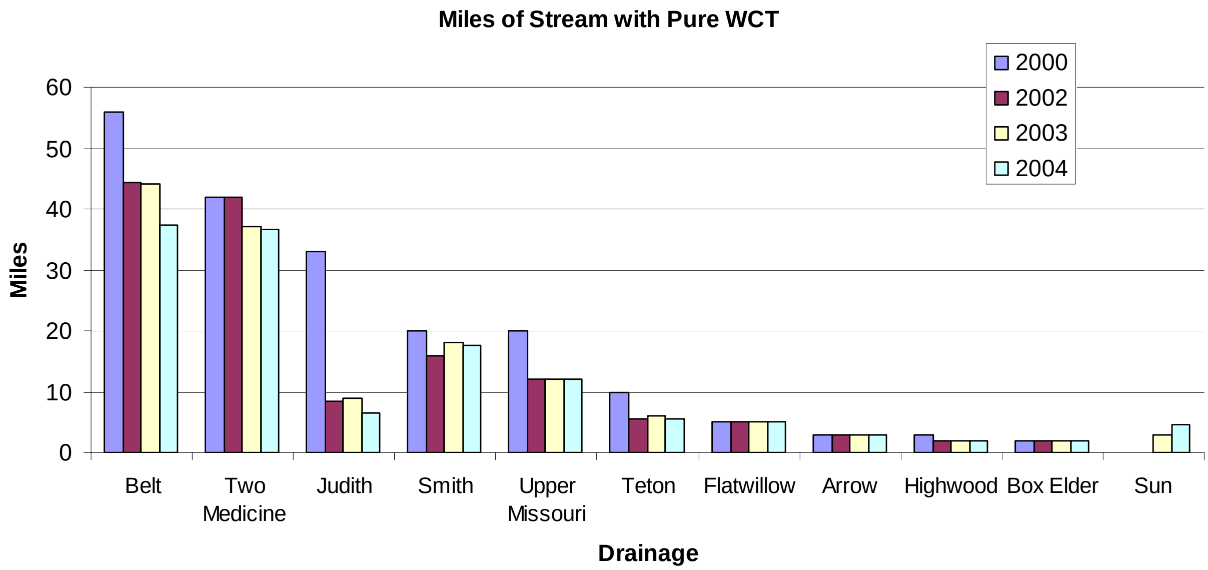

Figure 2. Miles of stream in large drainage basins with pure WCT from 2000 to 2004.

Restoration Projects, 2004

The following tables and text present the highlights of recovery efforts during 2004. Specifics related to restoration efforts and biological monitoring from 1999-2001 have been presented in MFWP annual coldwater reports (Tews et al. 1999 and 2000; Tews et al. 2001). Specifics related to restoration and biological monitoring from 2002 to 2003 have been presented in MFWP Northcentral Montana WCT reports (Moser et al. 2002, 2003)

In general, restoration efforts involve use of the following methodologies: 1) creation of fish barriers, 2) brook trout suppression/eradication, and 3) WCT transfers (replication or expansion opportunities). These methodologies were outlined in the 2000 SRS (Tews et al. 2000) as well as the 1999 Memorandum of Understanding and Conservation Agreement (MFWP 1999). These efforts focus on protecting existing pure populations through creation of barriers to upstream movement of non-native fishes, maintaining status quo of populations by suppression of non-native fishes (generally temporary measures), and increasing the range of pure populations through transfer to headwater habitats devoid of fishes or into habitats where non-native fish have been removed by use of piscicides. A decision was made not to suppress non-native brook trout in streams where WCT have introgressed (90-99.9%) with rainbow trout (unless special circumstances warrant removal; e.g. it is the last population in a large basin). This decision was made necessary because of limited resources and the presence of numerous populations of pure cutthroat threatened by brook trout. If additional resources become available, efforts to suppress brook trout in nearly pure populations of WCT may be initiated.

In addition to the aforementioned restoration efforts, collection of baseline and monitoring information is integral to evaluation of success of projects and modification of future restoration methodologies. Information collected in 2004 included: 1) fish abundance and biomass, 2) instream habitat quality and quantity, 3) stream temperature and conductivity, 3) invertebrate samples, amphibian surveys, and fish disease collections (for transfers), and 4) fish population genetic samples.

Summary of Survey and Restoration Efforts by Drainage

Statistics of fish sampled during 2003 are listed in Appendix 7. Streams were sampled by USFS and MFWP crews. Genetic test results from prior years sampling were received from 16 streams (Appendix 8). In 2003, MFWP, USFS and USFWS personnel took tissue from *Oncorhynchus* sp. for genetic testing on 12 streams region-wide (Appendix 9). Information on specific conductance and stream temperature was collected at most fish sampling locations (Appendix 10). Water temperature may play an important role in persistence of WCT populations in Rocky Mountain streams. Low mean summer water temperatures have been linked to poor persistence of allopatric populations of WCT (Harig and Fausch 2002). In addition, populations of WCT relegated to high elevation stream reaches by competition with brook trout may also show poor survival and persistence and will also likely decline (Peterson et al. 2004).

Shepard (2004) posited that other abiotic factors such as woody debris, pool frequencies, and fine sediments (all potentially modified by land use practices) may influence brook trout invasion and displacement of WCT. Time constraints have precluded measurement of abiotic factors other than temperature and maximum pool depths during reconnaissance of potential new habitats for transfer of WCT. An assumption has been made that in most cases - with the exception of extremely low temperatures - WCT will thrive in habitats free of competitive interaction with non-native brook trout.

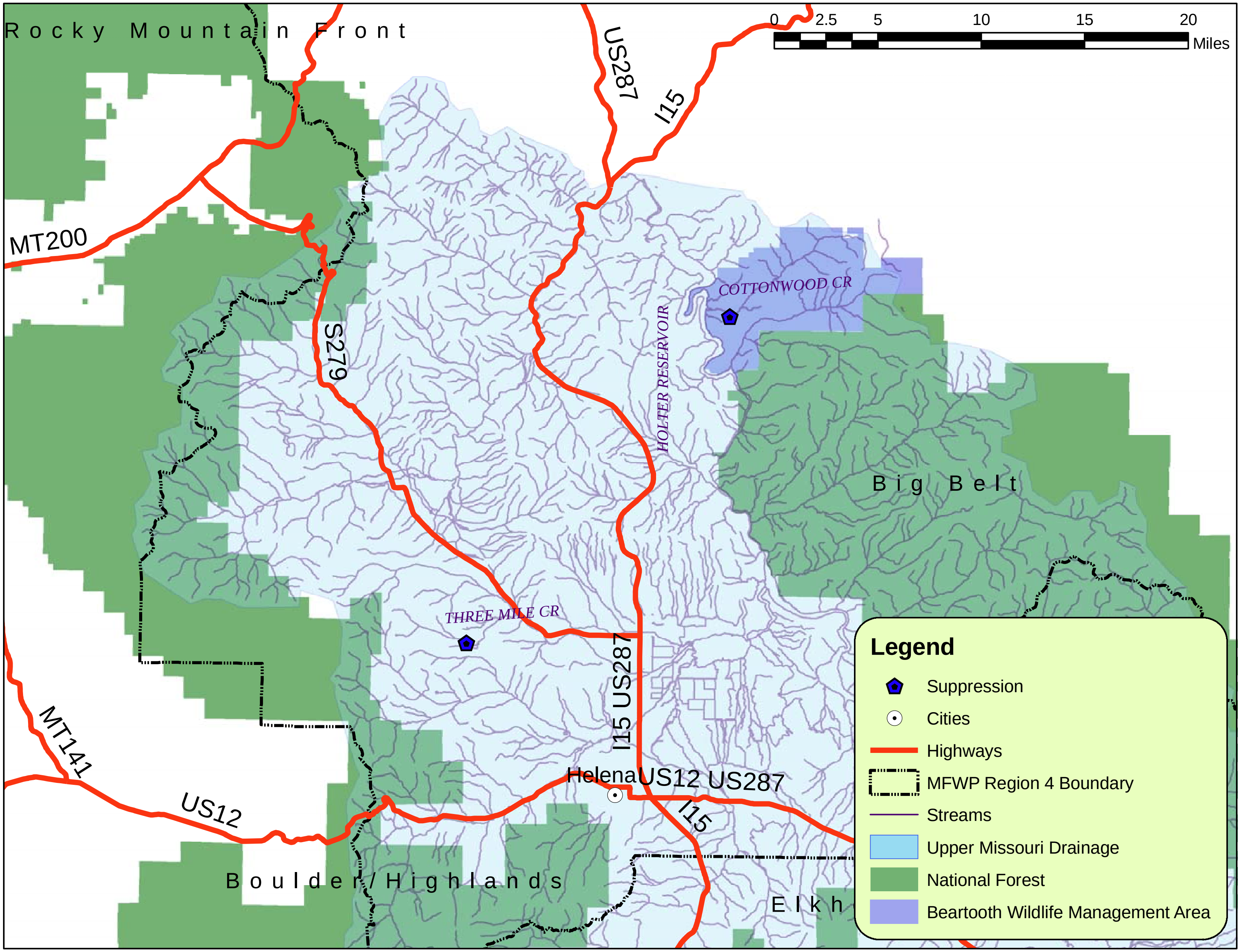

Figure 3. Upper Missouri Drainage location and sampling sites, 2004. White Suckers were suppressed in Three Mile Creek and EB were suppressed in Cottonwood Creek.

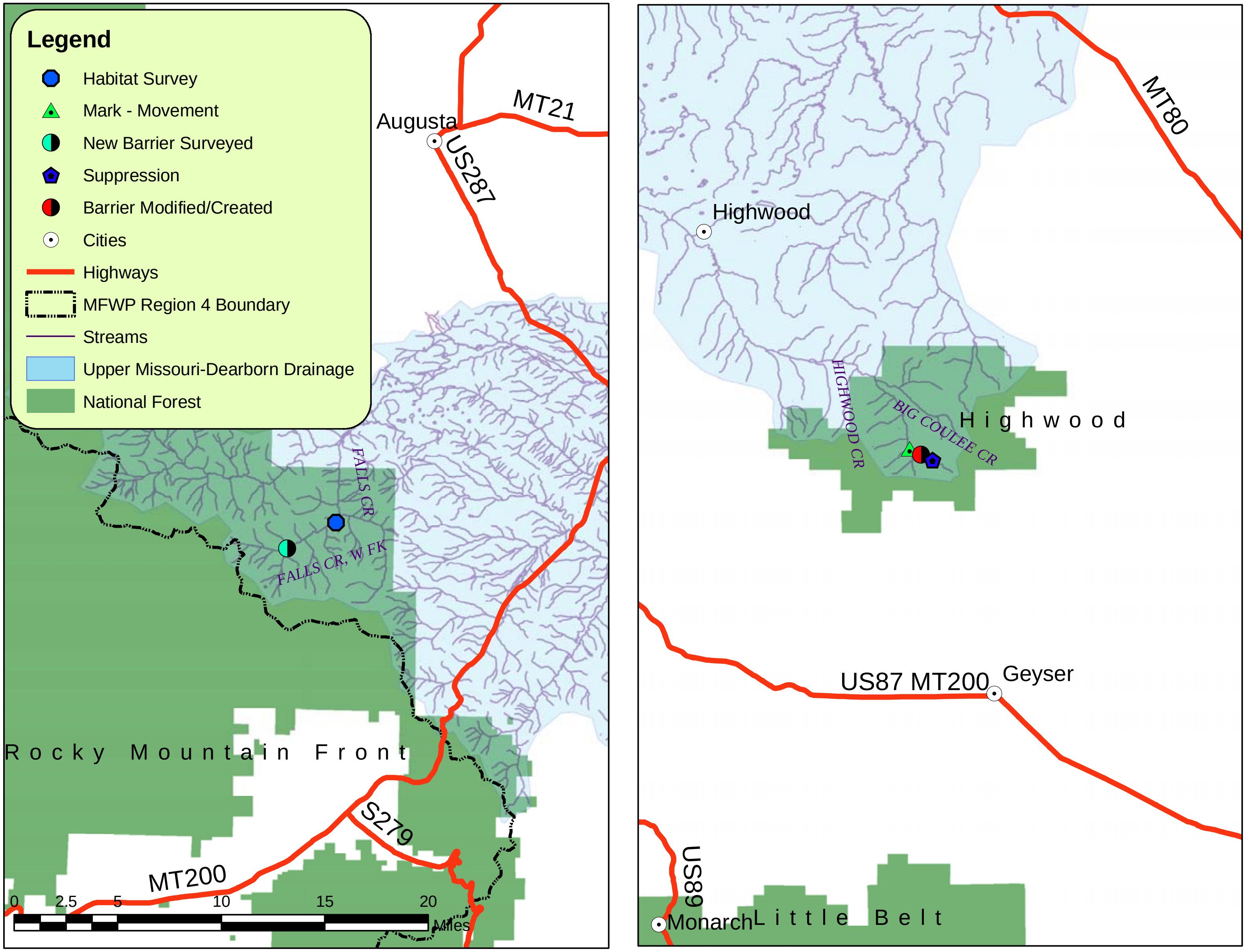

Figure 4. Upper Missouri - Dearborn Drainage location and sampling sites, 2004 (includes Highwood Creek). Brook trout were suppressed in Big Coulee Creek and Habitat surveys of Falls Creek included the East and Middle Forks.

Upper Missouri Drainage (4th Code HUC 10030101)

Major WCT restoration accomplishments in the Upper Missouri Drainage included suppression of white suckers in Three Mile Creek Reservoir, and suppression of eastern brook trout (EB) in Cottonwood Creek.

<u>Three-Mile Creek</u> In Spring/Summer of 2004, four trap nets were placed in Three Mile Creek reservoir to attempt to remove white suckers *(Catostomus commersoni)* that were competing for habitat space with a pure WCT population (Figure 3). The WCT population in Three Mile Creek and its reservoir were once robust until transplantation of white suckers by an unknown party. Mark-recapture statistics from trap netting efforts indicated that there is a viable (>50 adults) WCT population in the reservoir. Thousands of white suckers were captured in Three Mile Creek Reservoir over numerous netting days. White suckers will continue to be suppressed until restoration solutions for the drainage are developed. Preparations were made for an eradication project in 2005. The eradication plan involves holding as many WCT off site as possible, treating the system with piscicide, and refounding with surviving individuals.

<u>Cottonwood Creek</u> Attempts were made on three occasions in 2004 (1 April, 19-21 July, 31 August -1 September) to remove any remaining EB which survived the piscicide restoration of Cottonwood Creek (2003; Figure 3). Two EB were found during the July sampling and 1 EB was found during the August/September sampling. Surviving EB were found in spring/seep areas that likely provided refugia from fish toxicant during treatment. Additional suppression is planned for 2005.

Upper Missouri - Dearborn Drainage, including Highwood Creek (4th Code HUC 10030102)

Major WCT restoration accomplishments in the Upper Missouri - Dearborn drainage included habitat surveys of the Falls Creek Drainage, enhancement of a barrier on Big Coulee Creek (Highwood Creek Drainage), and suppression of EB on Big Coulee Creek.

<u>Falls Creek, West Fork</u> A barrier falls survey was conducted in the upper end of West Fork Falls Creek on 10 and 11 August 2004. A barrier was found at T17N R7W Sec30 (Figure 4). Approximately 30 brook trout greater than 254 mm in length were observed in the pool immediately below the barrier. Habitat surveys of the West Fork Falls Creek above the barrier revealed a limited amount of habitat.

<u>Falls Creek, Middle Fork</u> A habitat survey of Middle Fork Falls Creek was conducted on 11 August 2004 to assess potential habitat for a WCT introduction (Figure 4). The stream is fishless because of the barrier located on West Fork Falls Creek. The Middle Fork Falls Creek has excellent step pool habitat with abundant woody debris and 2-3 meters of wetted width for about 1.6 miles. Flows become limiting a short distance upstream where the creek forks for the last time. There is a partial fish barrier created by a 3-ft. high boulder cluster falls, approximately one-third mile upstream from the mouth. Adult fish may be able to negotiate this barrier at high flows. However, this barrier could be modified to facilitate passage by prying the center boulder out of the notch.

<u>Falls Creek, East Fork</u> A habitat survey was conducted in the East Fork of Falls Creek on 8 August 2004 to assess opportunities for establishing a new population of WCT (Figure 4). The reaches surveyed are upstream of several large historical waterfall barriers that were fishless until brook and rainbow trout were introduced early in the twentieth century by MFWP. No barriers were found in the East Fork during this survey. The first mile of stream contains excellent habitat and abundant brook trout up to 254 mm long. Deep overwintering pools are common in this section (≈2.5 ft.), the channel is stable, riparian vegetation is robust and grazing impacts are low. This stream contains approximately 3-4 miles of excellent fish habitat.

<u>Big Coulee Creek</u> On 2 November 2004 a barrier on Big Coulee Creek that had previously been blasted out of bedrock was enhanced with additional blasting (Figure 4). The barrier was originally created in 2002. Subsequent surveys after suppression efforts (Moser et al. 2003) indicated that the barrier was not effective for larger fish at higher flows. A USFS crew obtained approximately 1-2 feet of additional drop with additional blasting. The new dimensions of the barrier will be more accurately determined after the blast rubble is removed in the spring of 2005. Brook trout suppression upstream of the barrier was conducted on 12 July, 30-31 August, and 1 September 2004. Since 2002 (initial barrier construction), suppression has halved brook numbers annually. Prior to 2002, suppression efforts upstream of the natural partial barrier (campsite location) reduced brook trout numbers by approximately ¼ annually (Figure 5, Appendix 7). Barrier modifications in 2004 should effectively block all colonization by non-native species (and WCT as well). Recruitment increased in the upper sections of Big Coulee Creek from 2002 to 2003 (5 to 60 fish ≤100 m; Figure 6, Appendix 7). Recruitment in 2004 (37 fish ≤ 100 m) was slightly less than 2003 but higher than 2002. A new livestock drift fence was constructed in 2004 in an effort to reduce grazing impacts on upper Big Coulee Creek. Despite the new drift fence livestock were observed in the upper reaches of Big Coulee in late summer 2004. The drift fence will be extended in 2005 to prevent additional stream access by cattle.

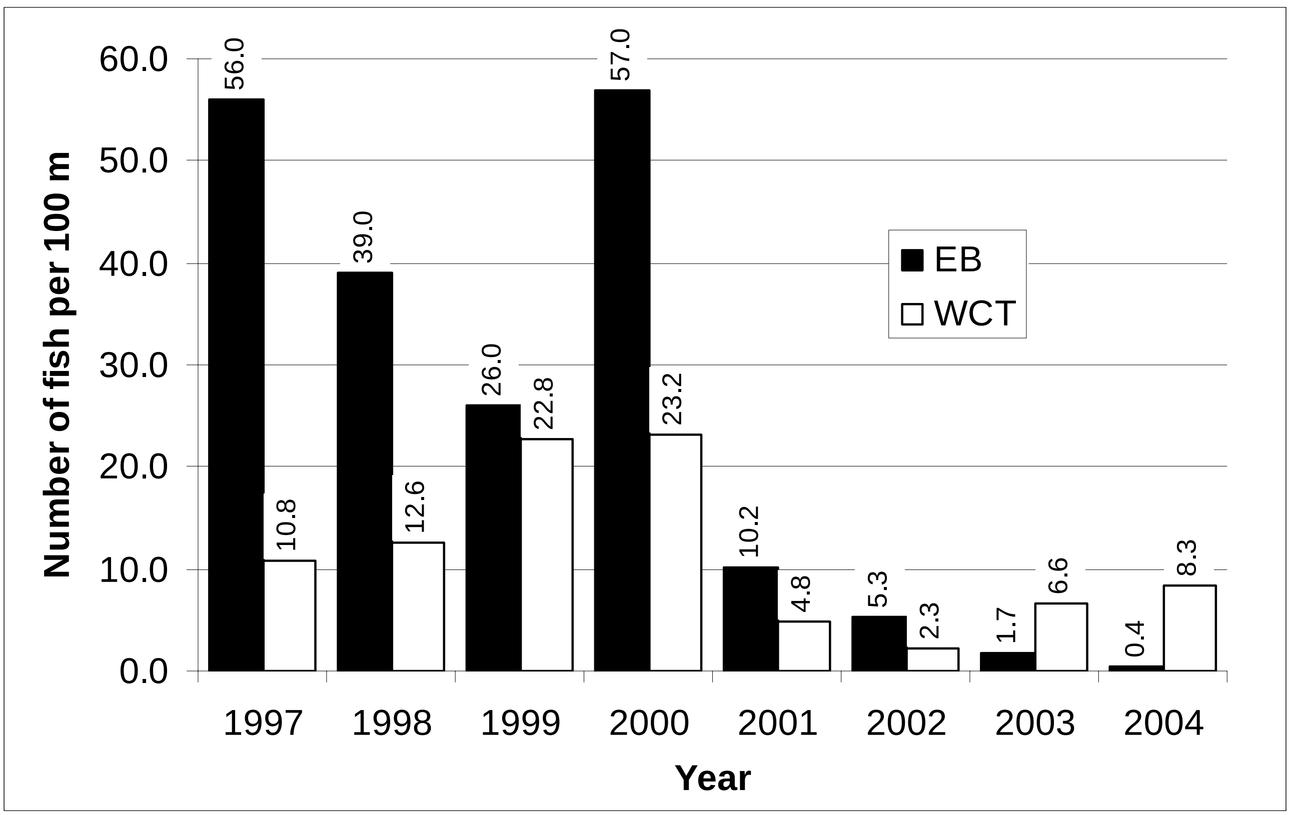

Figure 5. Relative abundance of all WCT and EB (all sizes) captured in Big Coulee Creek (upstream of natural campsite barrier) during brook trout suppression. Numbers represent relative abundance of fish normalized to fish/100m. Suppression efforts began in 1997.

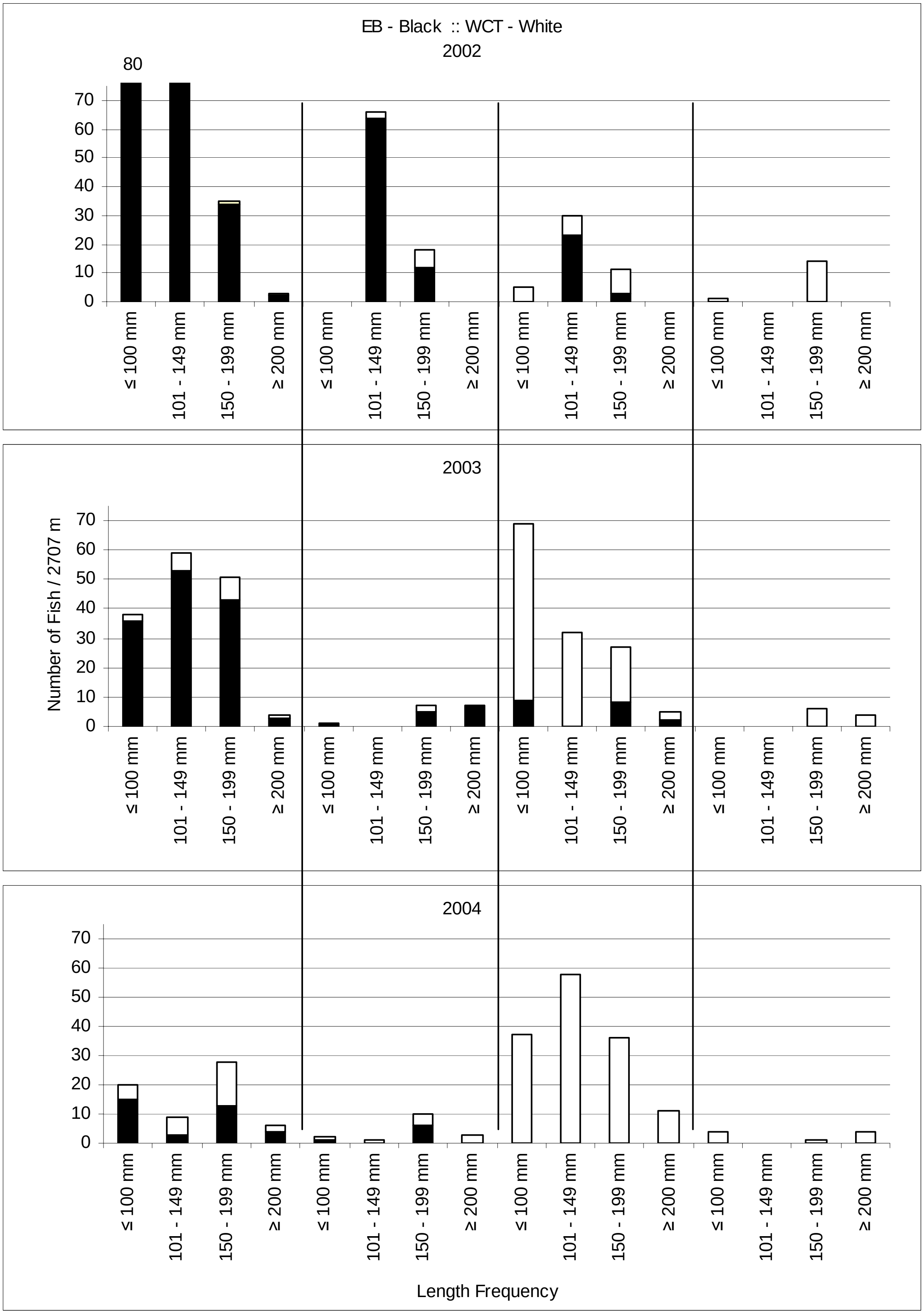

Figure 6. Length frequency of all WCT and EB captured in Big Coulee Creek in 2002, 2003, and 2004. Each sub-plot from left to right (upstream direction) represents approximately a quarter of the electrofished stream (2,707 m total length of electrofished stream). The first sub-plot is between blasted barrier and campsite barrier.

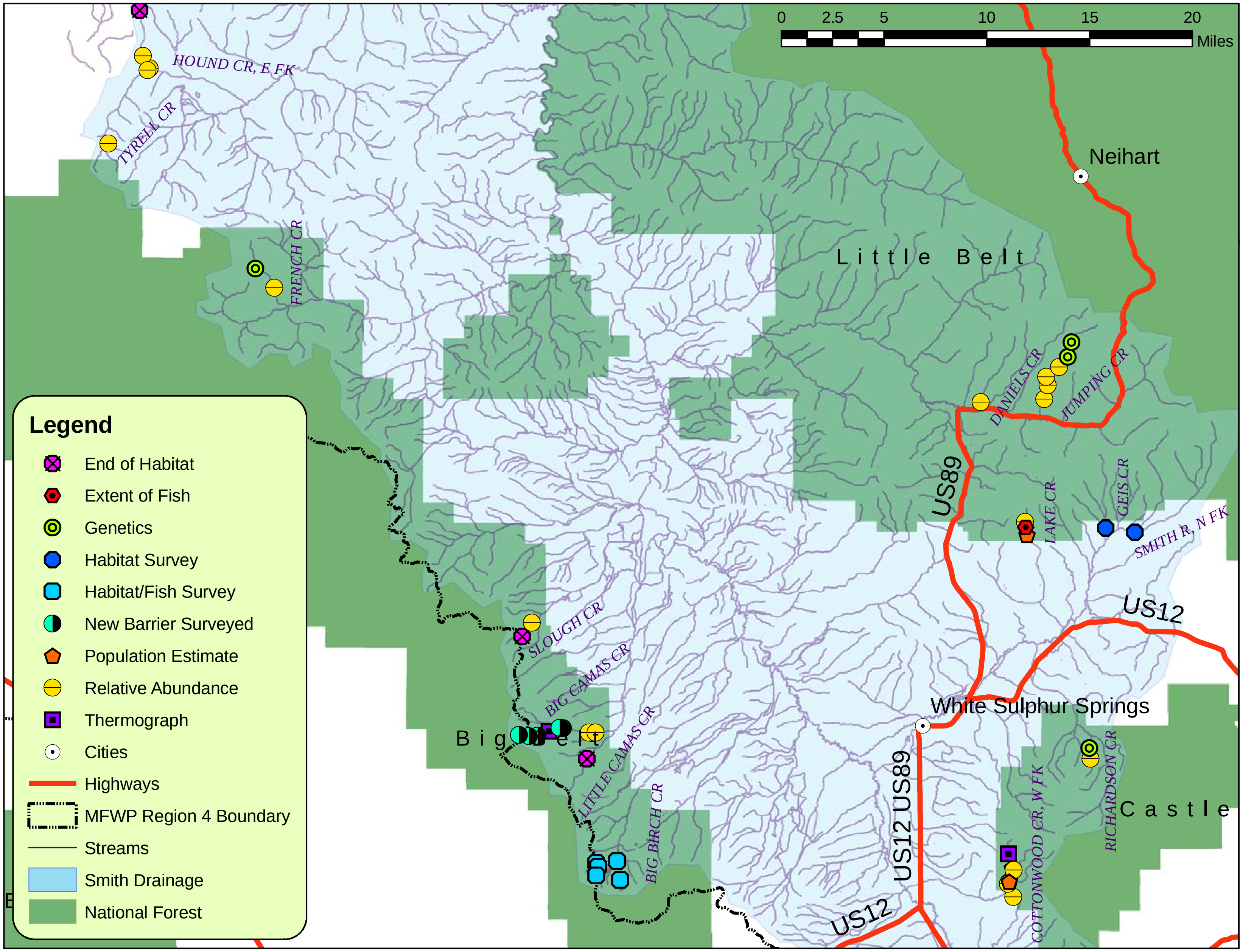

Figure 7. Smith Drainage location and sampling sites, 2004.

Smith River (4th Code HUC 10030103)

The major accomplishments related to WCT restoration in the Smith River Drainage included a survey of Pole Creek and Tyrell Creek for surviving non-native fishes (piscicide treatment in 2000), a longitudinal survey of Jumping Creek, population estimates in Cottonwood Creek (Castle Mountains), a longitudinal survey of Lake Creek, habitat surveys and gill netting of Edith and Hidden lakes, barrier survey of Big Camas Creek, and relative abundance surveys of Slough and French Creeks.

Big Camas Creek On 7 September 2004, Big Camas Creek was spot electrofished from where brook trout are present (near access road) upstream to Middle Camas Creek (Figure 7). Previous electrofishing in lower reaches of Big Camas Creek indicated the presence of EB and WCT hybrids (1991; 96% WCT X 4% YCT) while upstream samples (above Middle Camas Creek) only held pure YCT (2001; 100% YCT). Surveys revealed two falls barriers to upstream movement of EB (T9N R4E Sec16). These falls are also likely barriers at most flows to upstream movement of other salmonids Figure 7; Appendix 7). Upstream of the two barriers the floodplain widens considerably and habitat is excellent with copious quantities of large woody debris. Further upstream near the entrance of Middle Camas Creek additional falls and a long cascade barrier prevent all upstream movement of salmonids. An additional barrier survey of Middle Camas Creek was conducted on 14 July 2004 after it was determined that the Cottonwood Creek (Castles) WCT population was not robust enough to move additional fish to Middle Camas Creek (80 WCT moved 29 July 2003). Surveys indicate it is unlikely that current barriers fragmenting Middle Camas Creek can be modified for passage. This limits habitat in Middle Camas Creek above the barrier to approximately one mile of habitat. In addition, a thermograph was placed at the mouth of Middle Camas Creek on 14 July 2004. Though fragmented, the Big Camas Creek watershed may provide an excellent opportunity for restoration of a larger drainage area comprised of a variety of habitats (Camas Lake, Big Camas Creek, Middle Camas Creek).

Cottonwood Creek On 13 July 2004 three USFS and MFWP crews surveyed fish populations in Cottonwood Creek, W. Fork Cottonwood Creek, East Fork Cottonwood Creek, and several tributaries. Three population estimates (two pass) and three relative abundances (one pass) were estimated (Figure 7; Table 2; Appendix 7) to determine the approximate total population size and appropriate numbers of sub-adult and adult available for transfer to Middle Camas Creek (truck transfer). The total population in Cottonwood Creek was estimated to be 200 - 300 individuals in approximately 1.5 miles of stream. Conservatively, 20 - 30 fish could have been moved to Middle Fork Camas Creek without negatively impacting the source population. Crews experienced problems with a leaky oxygen regulator so the move was cancelled. In addition to fish surveys, a thermograph was placed in West Fork Cottonwood at the upper population estimate site (Appendix 7).

Daniels Creek On 23 September 2004, the lower reaches of Daniels Creek were surveyed by USFS and MFWP personnel. The stream was spot electrofished from the irrigation diversion (T12N R7E Sec28) upstream to a beaver dam complex. Several pure rainbow and hybrids were electrofished near the irrigation diversion. Surveyors upstream of the beaver dam complex found WCT that appeared to be pure. WCT in the upper reaches of Daniels Creek have previously tested as nearly pure (2001; 99.6% WCT).

Edith and Upper Baldy Lakes Edith Lake, Upper Baldy Lake, Edith Creek, Big Birch Creek, and several unnamed tributaries, were surveyed from 4-6 August 2004 (Figure 7). Edith Creek and Big Birch Creek were high gradient near their outfalls at Big Baldy Lake and Edith Lake. Habitat was good in Big Birch Creek with numerous overwintering pools one meter in residual depth. Further barrier surveys should be completed downstream of the confluence of Big Birch Creek and Edith Creek. Habitat in Edith Creek was marginal with numerous cascades and little spawning habitat.

French Creek On 13 September 2004 French Creek was surveyed for relative abundance of salmonids and genetics (Figure 7). Previous samples had indicated French Creek held pure WCT (1993 and 1997; 100% WCT; 10 fish samples). Initial electrofishing low in the drainage revealed the presence of hybrids and pure rainbow trout (Appendix 7). The stream was spot electrofished in an upstream direction. Numbers of fish declined through an area of old mine tailings and increased as the stream entered national forest. 25 genetics samples (PINE) were collected just downstream of where French Creek splits into two channels (Appendix 9). There were no identifiable barriers between obviously hybridized fishes in downstream areas and fish in the headwaters. There is some indication that the old mine tailings are continually avulsing and my have been a biological and physical barrier in past years.

Geis Creek, North Fork Smith River The former Dunkel Ranch (now Smith River Wilderness Ranch) at the head end of North Fork Smith River was recently sold and the new landowners, through a private consultant (Scott Gillilan), expressed an interest in WCT restoration on their property (Figure 7). A field visit was arranged for 29 September 2004 during which David Moser and Brad Shepard toured the ranch with Scott Gillilan. During the field visit two potential projects were discussed. The first project would involve the restoration of Geis Creek. The lower portions of Geis Creek are located on the Wilderness Ranch and the uppermost portions are on national forest land and small parcels of private land. Geis will be surveyed (fishes and barrier sites) in 2005 and if an opportunity exists for restoration, landowner willing, a project will be developed to restore WCT to the drainage. The other project will involve stocking of hatchery WCT in the headwaters of the North Fork of Smith River. The purpose of the stocking is to potentially create a more robust fishery and monitor the success of hatchery WCT living in sympatry with EB in the relatively cold temperature regime of upper North Fork Smith. After preliminary surveys in 2005, potential projects will be outlined in either a memorandum of Understanding or Candidate Conservation Agreement with Assurances.

Jumping Creek Jumping Creek was surveyed on 8 September 2004. In previous years, small numbers of WCT were sampled in upper Jumping Creek. Fin clips collected from 7 fish encountered in 2001 indicated the potential for a pure WCT fishery (2001; 100% WCT). In 2004, Jumping Creek was surveyed approximately every 0.5 miles in an upstream direction. EB were encountered the first two miles of sampling (Appendix 7). WCT were encountered at the 5th site and fin clips (10 PINE) were collected. An additional 15 fin clips were collected the next day, and sent to the Wild Trout and Salmon Genetics Laboratory for processing. Results indicated that the 25 fish were genetically pure WCT (Appendix 8). This population is currently living in sympatry with EB, but is at critically low levels and is in danger of extirpation. EB suppression efforts will be initiated in 2005 and may continue until a restoration/protection solution is developed.

Lake Creek On 24 June 2004 Lake Creek was surveyed to determine the extent of stream inhabited by salmonids and get an estimate of numbers of fish per 100 m of stream (Figure 7; Table 2; Appendix 7). Lake Creek has been evaluated as a possible area to restore WCT in past years, but costs for a typical barrier structure would be prohibitive weighed against the total potential WCT population size. Approximately 1,000 m of Lake Creek held salmonid fishes upstream of Crater Lake. Approximately 600 m of this length was meandering meadow stream and 400 m was beaver dam complexes with intermittent sections of low gradient stream. Densities of hybrid fish (last tested in 2000; 72% WCT X 14% YCT X 5% RBT hybrids) in the sampled stream were low (Table 2). These low numbers may be because of the lack of total instream habitat or low summer water temperatures (Appendix 1) Lake Creek probably holds less than 200 fishes in approximately 1,000 m of habitable stream. The number of fishes in Crater Lake is unknown but is likely less than 1,000. A total population of 2,500 fish is the number of fish suggested by Hilderbrand and Kerschner (2000) as the minimum to maintain long term persistence of salmonids upstream of migration barriers. In addition, temperature data collected from Lake Creek (Appendix 1) indicates mean July stream temperatures may not be high enough for successful reproduction and recruitment over longer periods of time (Harig and Fausch 2002). Numerous small populations of less than 2,500 individuals have survived for many years in isolation in streams in northcentral Montana. However, expending a large amount of money (that could perhaps be spent elsewhere with more benefit) for a large barrier in Lake Creek may not be wise. We will continue to pursue opportunities for lower cost barriers in Lake Creek along with non-native removal and restoration with pure WCT.

Camas Creek, Little On 2 September 2004 Little Camas Creek was surveyed for potential restoration opportunities (Figure 7). Little Camas Creek is fishless above a culvert at forest road 383. Fish habitat is marginal, with an average residual pool depth in its lower reaches of approximately 1 ft. Little Camas was surveyed for 900 m above the road crossing. The lack of deep pools and high stream gradient limit the amount of available habitat and probable success of any restoration projects in Little Camas Creek.

Richardson Creek On 22 July 2004 two sections of Richardson Creek were sampled. Genetics (13 PINE) were taken from fish in the lower section (Appendix 9). Seven fish were observed in the upper section. The Richardson Creek population appears to be surviving with very few individuals.

Slough Creek A small population of WCT survived in Slough Creek as late as 1995 (Archie Harper, personal communication). On 14 September 2004 Slough Creek was surveyed for the presence of WCT (Figure 7; Appendix 7). All of Slough Creek is on private property and permission was obtained prior to accessing the property. Two crews surveyed the stream, one in an upstream direction and one in a downstream direction. EB were found in low densities the entire length of Slough Creek (1.0 miles of wetted stream). It appears that the Slough Creek population is extinct.

Tyrell Creek, Pole Creek, Hound Creek Reservoir In 2000, the upper Hound Creek Reservoir and its tributaries (Tyrell and Pole creeks) were treated with rotenone to remove non-native fishes. In 2001, several EB were found and removed from Tyrell Creek directly upstream of the reservoir. In 2002, 2003, and 2004, no non-native fishes were found in Tyrell Creek using electrofishing equipment or Hound Creek Reservoir through the use of trap nets and gill nets. The majority of Tyrell Creek was electrofished on five occasions from 9 June to 23 June 2004. No fish other than *Cottus* sp. were encountered during electrofishing efforts and during snorkeling of lower beaver ponds in 2004. Small mesh trap nets (2) were placed in Hound Creek Reservoir from 9 June to 6 July 2004. No fish other than grayling were caught in trap nets. In addition, a gill net was placed overnight one night on 1 July 2004. 18 grayling (*Thymallus* sp.) were caught in the gill net. Fish averaged 362 mm and 663 g (range 320-432 mm). Pole Creek was electrofished on four occasions from 9 June to 28 June 2004 (Figure 7). 10 EB were found in approximately 1000 meters of stream. Most fish were about 200 mm in length (range 190-250 mm). After further sampling in 2005 to determine that Tyrell Creek and Hound Creek Reservoir are fishless, Pole Creek will probably be treated with piscicides (antimycin or rotenone). Treatment will be predicated on pertinent landowners signing the Candidate Conservation Agreement with Assurances developed between MFWP and the USFWS. If Tyrell Creek and Hound Creek Reservoir are found to be supporting EB, then a full re-treatment of the drainage will be necessary prior to restoration. Potential donors for restoration have been identified and an environmental assessment has been posted for public review. Donors will come from two of three pure Belt Creek WCT populations, including, Carpenter, O'Brien, and Graveyard creeks. Stream temperatures in lower Tyrell Creek (Average July = 15.5 C) should provide excellent conditions for fish growth. If successful, this project has the potential to produce a popular recreational fishery as well as a robust conservation population of WCT.

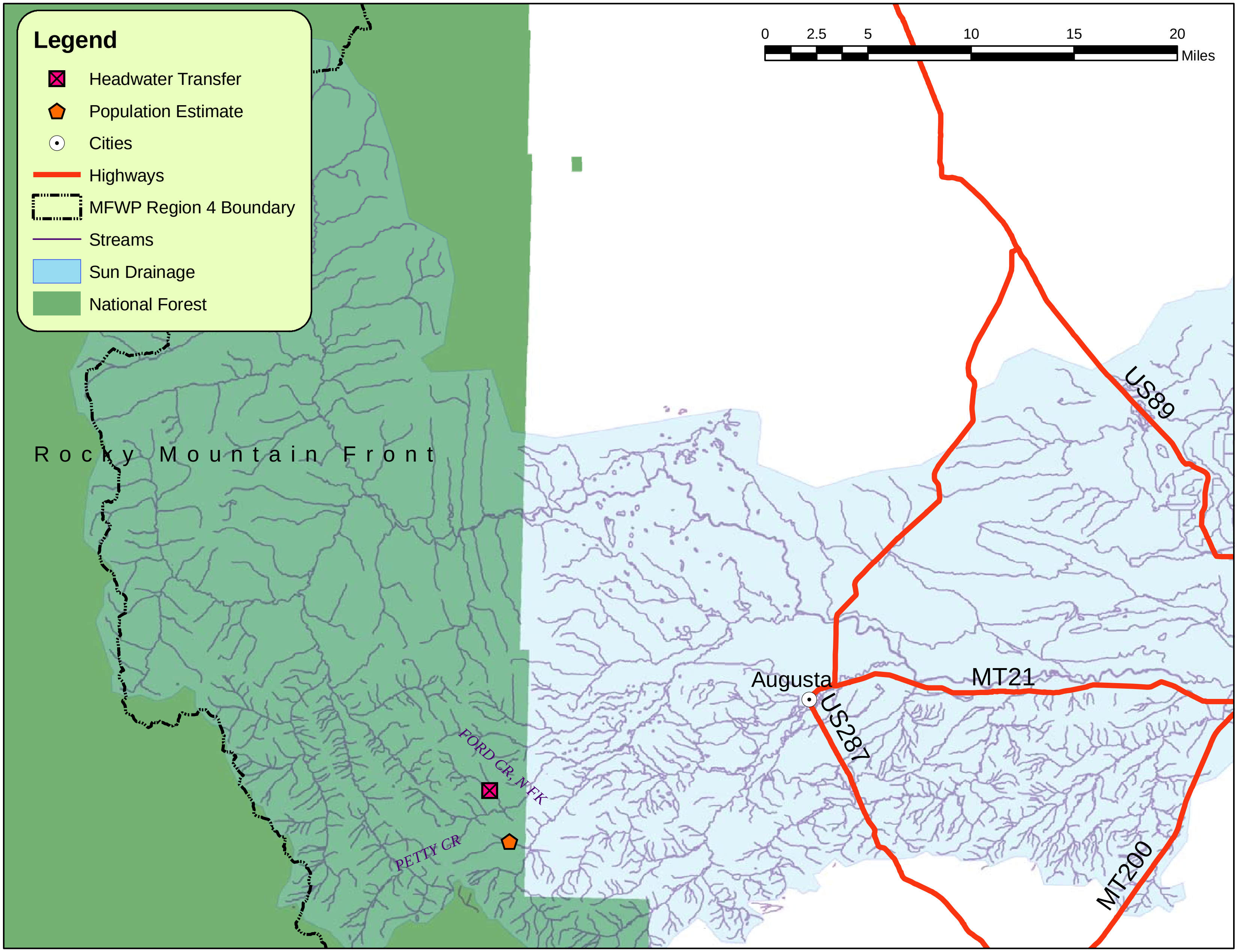

Figure 8. Sun Drainage location and sampling sites, 2004.

Sun Drainage (4th Code HUC 10030104)

The major accomplishments related to WCT restoration in the Sun River Drainage included a post stocking (WCT) survey of Petty Creek for natural reproduction and a new plant/transfer of WCT to a previously fishless area of North Fork Ford Creek.

North Fork Ford Creek On 3 August 2004, 109 WCT ranging from 61 - 241 mm total length (average 165 mm) were moved from East Fork Big Spring Creek (Judith Drainage) to a previously fishless section of North Fork Ford Creek above a barrier waterfall (Figure 8). This new population will occupy approximately 1.5 miles of stream (Appendix 4). Average July stream temperatures of 11.9 C (Appendix 1) should be adequate for persistence of this headwater population (Harig and Fausch 2002) barring any other unknown limiting factors.

Petty Creek On 20 August 2004, Petty Creek was surveyed near the fish transfer release sites of 2002 and 2003 (Figure 8). 11 fish were found per 100 m of stream ranging in size from 101 to 224 mm (Table 2; Appendix 7). None of the fish captured were recruits from the 2002 spawn. Recruits from the 2003 spawn would be too small to capture efficiently. A more rigorous survey of Petty Creek upstream of the barrier site will be completed in 2005/2006. Mean July temperatures (7.5º C) in Petty Creek are very low (Moser et al. 2003), a possible limiting factor in transplantation success. Harig and Fausch (2002) suggested that mean July temperatures ≤ 7.8º C likely prevent successful reproduction and recruitment during most years. Future transfers in other streams should be predicated on average summer stream temperatures and residual pool depths adequate for overwinter and late summer survival.

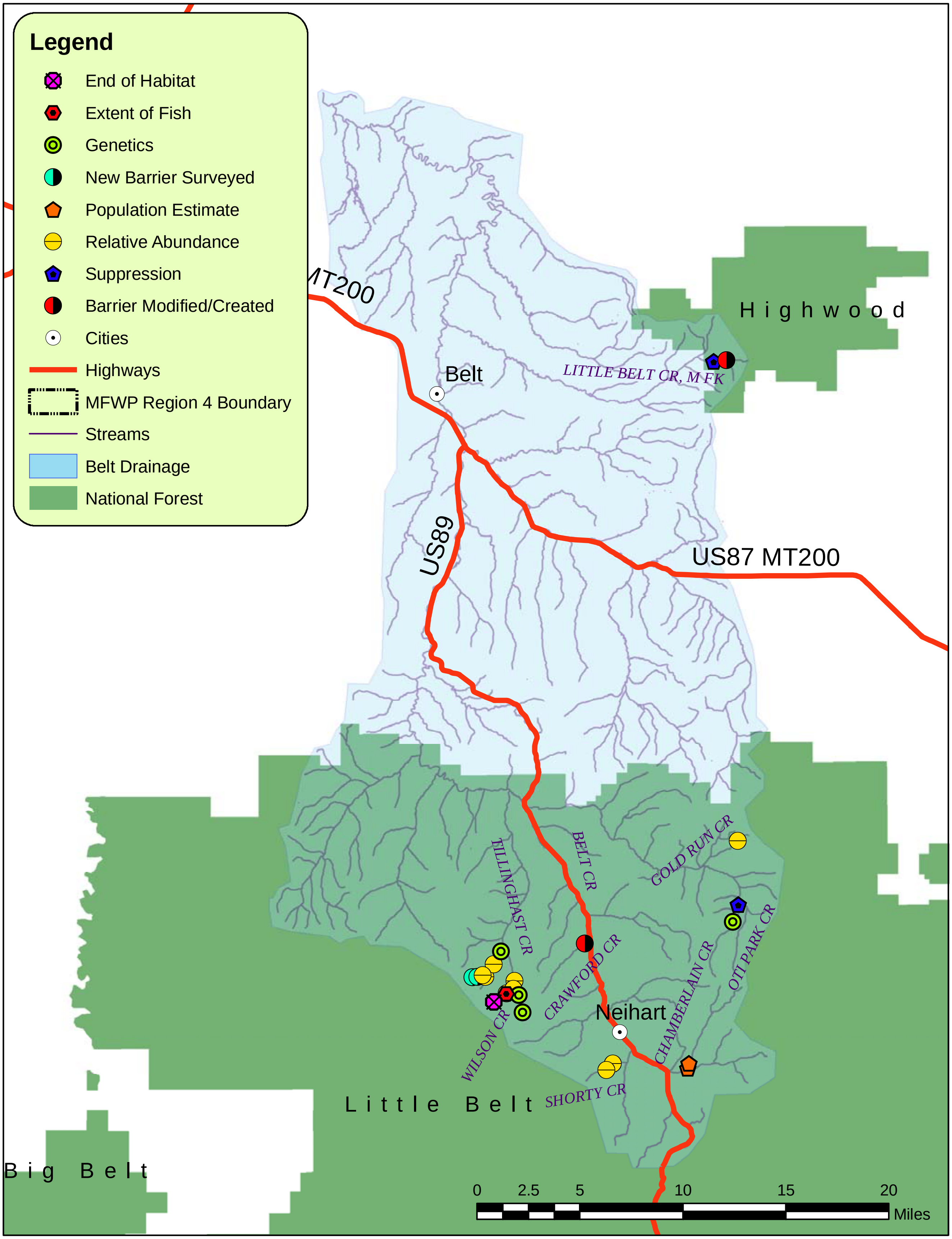

Figure 9. Belt Drainage location and sampling sites, 2004. Brook trout were suppressed in Middle Fork Little Belt and Oti Park creeks.

Belt Creek Drainage (4th Code HUC 10030105)

Major accomplishments related to WCT restoration in the Belt Creek Drainage included brook trout suppression in Middle Fork Little Belt Creek, design and construction of a barrier culvert on Middle Fork Little Belt Creek, relative abundance surveys and genetics surveys of Tillinghast Drainage, population estimates at long term monitoring stations on Chamberlain Creek, and relative abundance surveys of O'Brien Creek and Gold Run Creek.

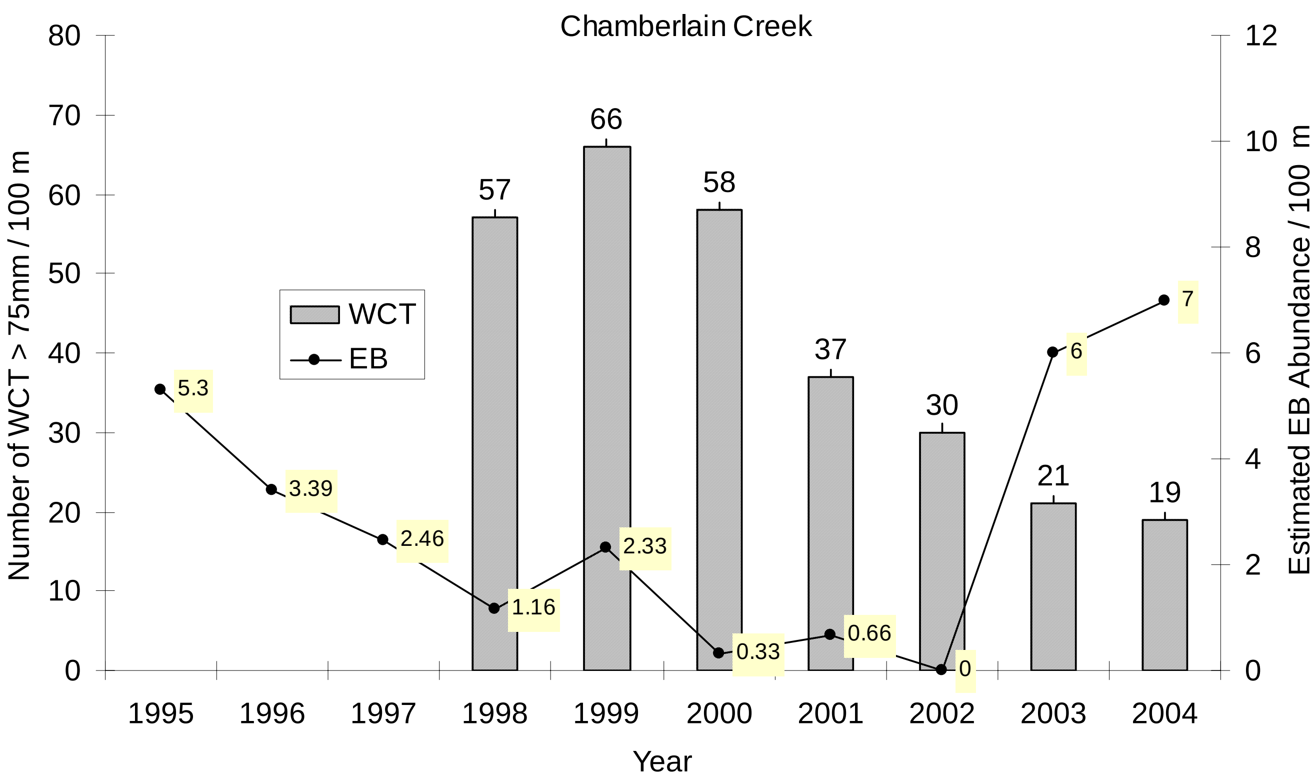

Figure 10. Abundance of WCT and EB removals in Chamberlain Creek from 1995-2004 at lower population monitoring sites (at or below barrier constructed in 2002). EB numbers prior to 2002 were calculated using total number of EB removed normalized to 100 m. EB numbers in 2002, 2003, and 2004 were obtained from population estimates.

<u>Carpenter Creek</u> Water temperatures will be monitored in various streams that maintain viable populations of WCT. The goal is to get an idea of the range of temperatures of streams where WCT survive to better predict whether future translocations will succeed. Stream temperatures were monitored in Carpenter Creek and North Fork Running Wolf in 2003. Average July temperatures in Carpenter Creek were 9.68 C.

<u>Chamberlain Creek</u> On 27 July 2004, population estimates were conducted at index stations below (Figure 9) and above a fish barrier constructed in 2002. A temporary barrier erected in 1996 and removed in 2002 below the lower index stations along with EB suppression significantly decreased EB numbers. Since removal of the lower temporary barrier in 2002, EB numbers have risen sharply (Figure 10; Table 2; Appendix 7). No EB have been found in population estimates conducted above the barrier constructed in 2002 (Table 2). Population estimates above the barrier from 2001-2004 generally yielded higher numbers of WCT (2001-42; 2002-29; 2003-30; 2004-29 /100 m) than the lower site (Table 2). Overall, numbers of

WCT have declined by half that observed from 1998-2000. These declines are most likely the result of continuing drought conditions. Spring runoff conditions Observations in 2004 suggest the possibility that some larger fish may be able to pass the barrier during spring runoff. The barrier will continue to be modified in future years to increase effectiveness at all flows.

<u>Gold Run Creek</u> On 21 September 2004, relative abundance was determined in Gold Run Creek in the section of stream where 45 WCT (total) were transferred in 2001 and 2004 (from downstream of several passage barriers; Figure 9). The fish transfer expanded the amount of habitable stream for the Gold Run population by 0.25 miles of stream (total protected habitat in Gold Run is approximately 0.5 miles). Five fish were caught between 70 and 195 mm. Four other fish were observed between 50 and 170 mm (Appendix 7). Two of the fish caught (70 and 130 mm) did not have adipose clipped fins and are assumed to be natural reproduction from the plants in 2001 and 2002. The other fish observed are also likely recruits from reproduction in 2002 and 2003. A full survey of the expanded Gold Run population is warranted. The minimum recommended transfer size to reduce risks of genetic inbreeding is 25 spawning pairs (Leary et al. 1998). The transfers in 2002 and 2002 are less than recommended even if all fish spawned and were evenly split males and females. A future infusion of small amounts of new genetic material from the downstream population or nearest neighbors (e.g. Carpenter Creek) may be warranted (Alexandre and Couvet 2004).

<u>Little Belt Creek, Middle Fork</u> On 14 and 28 July 2004, EB were suppressed in the Middle Fork of Little Belt Creek upstream of a culvert (Figures 9 and 11). A total of 36 EB were captured upstream of the road culvert in approximately 1,430 m of stream. Numbers of EB have continued to decrease despite the lack of a significant barrier to migration (Figure 12; Appendix 7). We suspect that large beaver dams upstream of the road culvert are operating as a partial barrier to EB. In 2004, some funds were obtained within the USFS roads department for replacement of the failing road culvert. A culvert design was developed cooperatively between forest engineers and forest and state biologists that would be an effective barrier to upstream fish migration. The failing twin 24” culverts were replaced with a single 60” 10 gauge corrugated pipe during fall/winter of 2004. The new culvert was elevated with fill and supported at the downstream end with gabions. A 10 x 8 x 0.5” splash pad was placed at the base of the outfall on top of a buried gabion. The downstream channel was excavated to obtain a total drop height of ≈4 ft. (Figure 11). The culvert barrier should function at nearly all flows as a passage barrier. The remaining EB will be eradicated in 2005/2006 using electrofishing equipment. After elimination of EB, (considered two survey years with no EB encountered) WCT will be monitored on an annual basis.

Figure 11. Photograph of old culvert and new culvert barrier on Middle Fork Little Belt Creek, 2004.

<u>Oti ParkCreek</u> EB were suppressed in Oti Park Creek for three days in 2004 (26 July, 6 August, 28 September 2004). In addition, genetics samples (20 PINE) were taken from upper Oti Park (T15N R9E

Sec31; Figure 9; Appendix 9). EB will not be suppressed in Oti Park in future years unless a barrier is constructed.

Shorty Creek On 8 July 2004, the upper end of Shorty Creek (tributary to O'Brien Creek) was surveyed in a downstream direction to find the extent of the WCT population. Fish were not found during this survey. On 20 July 2004 the extent of fish was found by surveying in an upstream direction from the mouth of O'Brien Creek (Figure 9; Appendix 7). The end of WCT was found approximately 1,100 meters from the mouth at O'Brien Creek. There were no obvious barriers to fish where the last fish was found, though the stream gradient increased and flows decreased significantly.

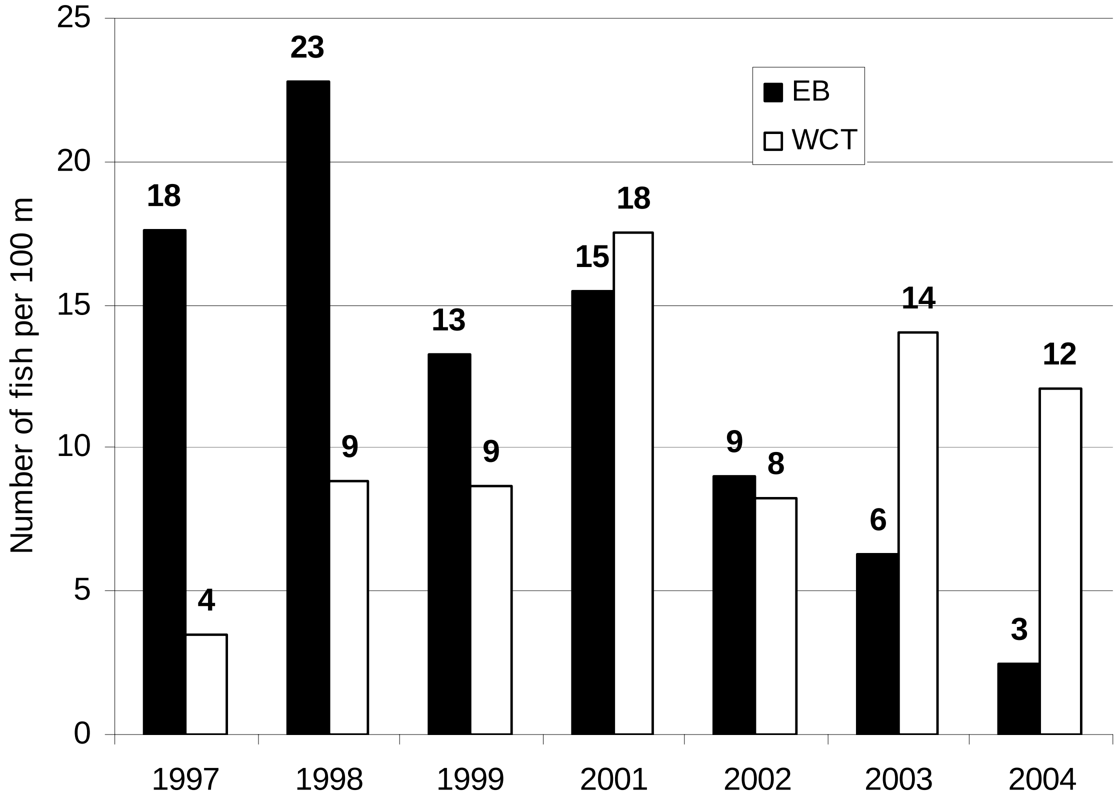

Figure 12. Relative abundance of all WCT and EB (all sizes) captured in the Middle Fork of Belt Creek in 2004. Numbers above bars are relative abundance of all fish caught during suppression efforts normalized to fish /100 m. Suppression efforts began in 1997.

Tillinghast Creek The upper portions of Tillinghast Creek including tributaries was surveyed to ascertain the distribution and abundance of WCT and potential barrier sites. The surveys were completed on 19 July 2004 (Wilson Creek and Tillinghast) and 21 and 29 July 2004 (Horn Creek)(Figure 9; Appendix 7). The upper portion of Wilson Creek (approximately 0.68 miles) was fishless with good habitat and numerous pools deeper than 1.5 ft. The origin of Wilson Creek is an extensive spring system so low temperatures (7.8 C at the time of sampling) may preclude a successful translocation of a population to this site. In addition, the downstream barrier is undefined and is likely a series of high gradient step pools and a short cascading section (200-300 m). A possible donor stream to consider is Upper Pilgrim Creek. It would be relatively simple to move fish over the divide from Pilgrim Creek to upper Wilson Creek. Seven genetic samples

(PINE) were taken from the uppermost inhabited portion of Wilson Creek (Appendix 7; Appendix 9). The lower reaches of Horn Creek held primarily EB and some WCT. Genetics were taken from 10 fish (PINE) in lower Horn Creek (Appendix 7; Appendix 9). The middle and upper portions of Horn Creek and a tributary to Horn Creek were intermittent. In addition the tributary had several barriers to fish passage. Tillinghast Creek near Wilson Creek was very productive with numerous WCT hybrids and EB. Genetic samples (10 PINE) were taken from the lower, middle, and upper reaches of Tillinghast Creek (Appendix 7; Appendix 9). The uppermost reach of Tillinghast Creek may still hold some pure WCT. However, the lower reaches appear to be heavily hybridized. These results are reflected in new estimates calculated for miles of stream containing pure WCT (Table 1; Appendix 3).

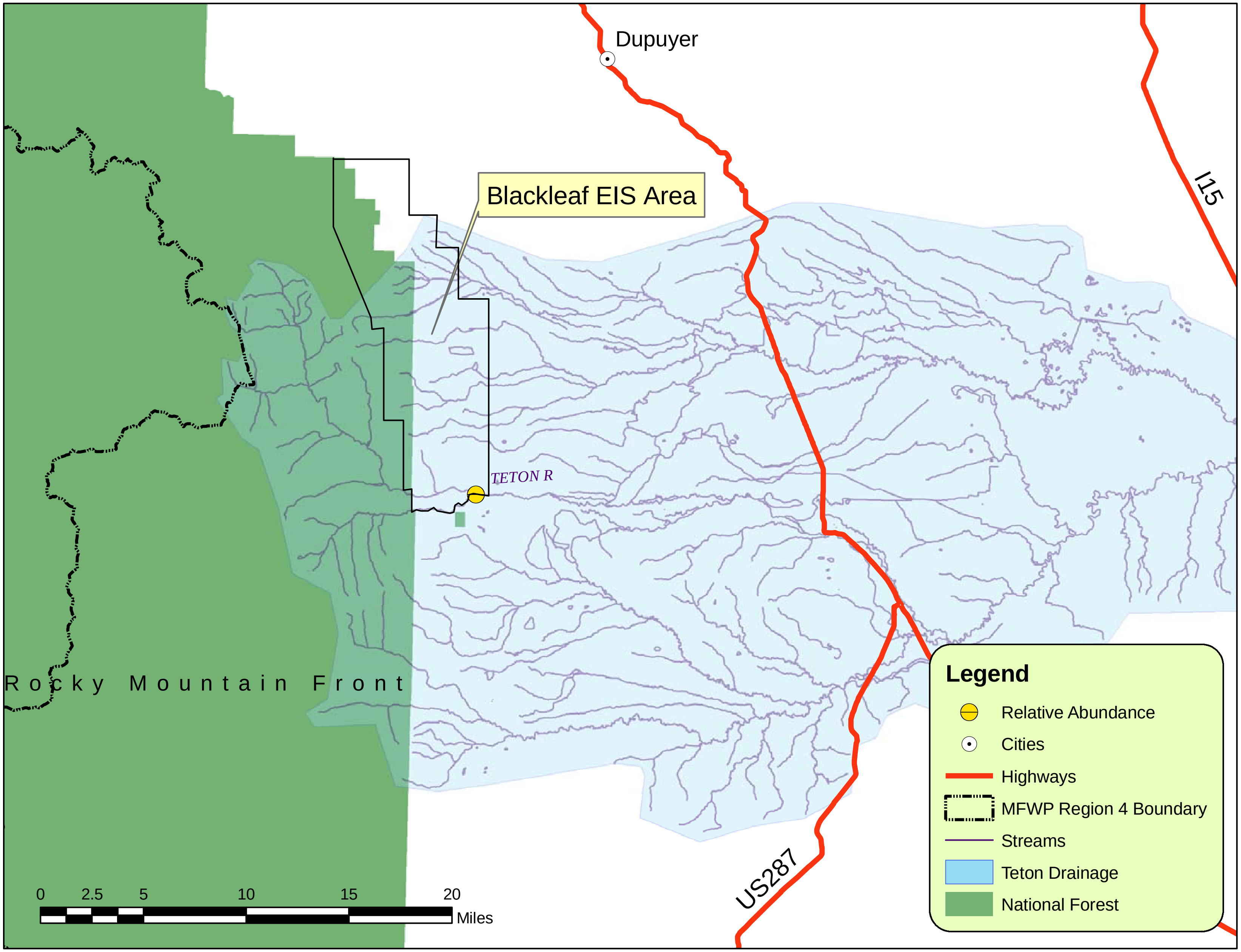

Figure 13. Teton Drainage location and sampling sites, 2004.

Teton Drainage (4th Code HUC 10030205)

Major accomplishments related to WCT restoration in the Teton Drainage included, sampling the Teton River to assess population characteristics and demographics for the Blackleaf Oil and Gas Project Area EIS.

<u>Teton River</u> MFWP was contracted by the USFS and the Bureau of Land Management to conduct fish surveys in streams known to support westslope cutthroat trout within and near the proposed Blackleaf Oil and Gas Project Area (Figure 13). In 2003, surveys and a report were completed describing fisheries resources in Dupuyer and Cow Creeks (Moser 2003). In 2004, an additional fisheries survey was conducted on the Teton River on the southern edge of the Blackleaf Oil and Gas Project Area, within the watershed cumulative effects zone for the environmental impact statement.

The study area was located approximately 3 miles east of national forest land on the southern boundary of the Blackleaf Oil and Gas Project Area (Figure 13). On 7 October 2004 approximately 1,270 meters of the Teton River downstream of the confluence with South Fork Teton River was surveyed using electrofishing equipment. A mobile electrofishing unit (Coffelt VVP, 400 volts non-pulsed DC) was used to collect fish. A crew of three surveyed in a downstream direction. A mark/recapture methodology was to be used to estimate abundance. Not enough fish were captured on the marking run to effectively estimate abundance so no fish were marked and no recapture run was completed. Fish that were captured responded well to the settings used and visibility was excellent so the assumption was made that the lack of captured fish was indicative of low population levels and not poor capture efficiencies. After fish were captured, they were anesthetized and total lengths and weights were recorded. Water temperature in the study reach was 8.9 C and conductivity was 390 *u*S (Appendix 10). Habitat in the study reach (1,270 m) lacked a riparian corridor and was dominated by long uninterrupted sections of shallow low gradient riffle. Several sections of high gradient riffle followed by small shallow pool areas were also encountered. There was one good over-wintering pool created by the bridge at the end of the study reach. Large or small woody debris was essentially non-existent. It is apparent that this section of the Teton River is still in the early stages of recovery from large flood events in 1964 and 1975. Two small EB were captured (Appendix 7) over the first 1,250 m of stream. Numerous sculpin (*Cottus* sp.) were also seen in the first 1,250 meters of stream. The bridge pool at the end of the section held the remainder of fish captured, including, whitefish (*Prosopium williamsoni*), cutthroat trout (*Oncorhynchus* sp.; most likely westslope cutthroat trout), rainbow trout (*Oncorhynchus* sp.), brown trout (*Salmo trutta*) and brook trout (Appendix 7). This section of the Teton River is clearly habitat limited and would likely require large-scale channel reconstruction to maintain long term increases in fish populations and biomass. There could be fishery benefits from modest additions of instream structures (e.g. boulder clusters and large wood structures). These benefits would likely be short term but would almost certainly increase fish numbers from current levels.

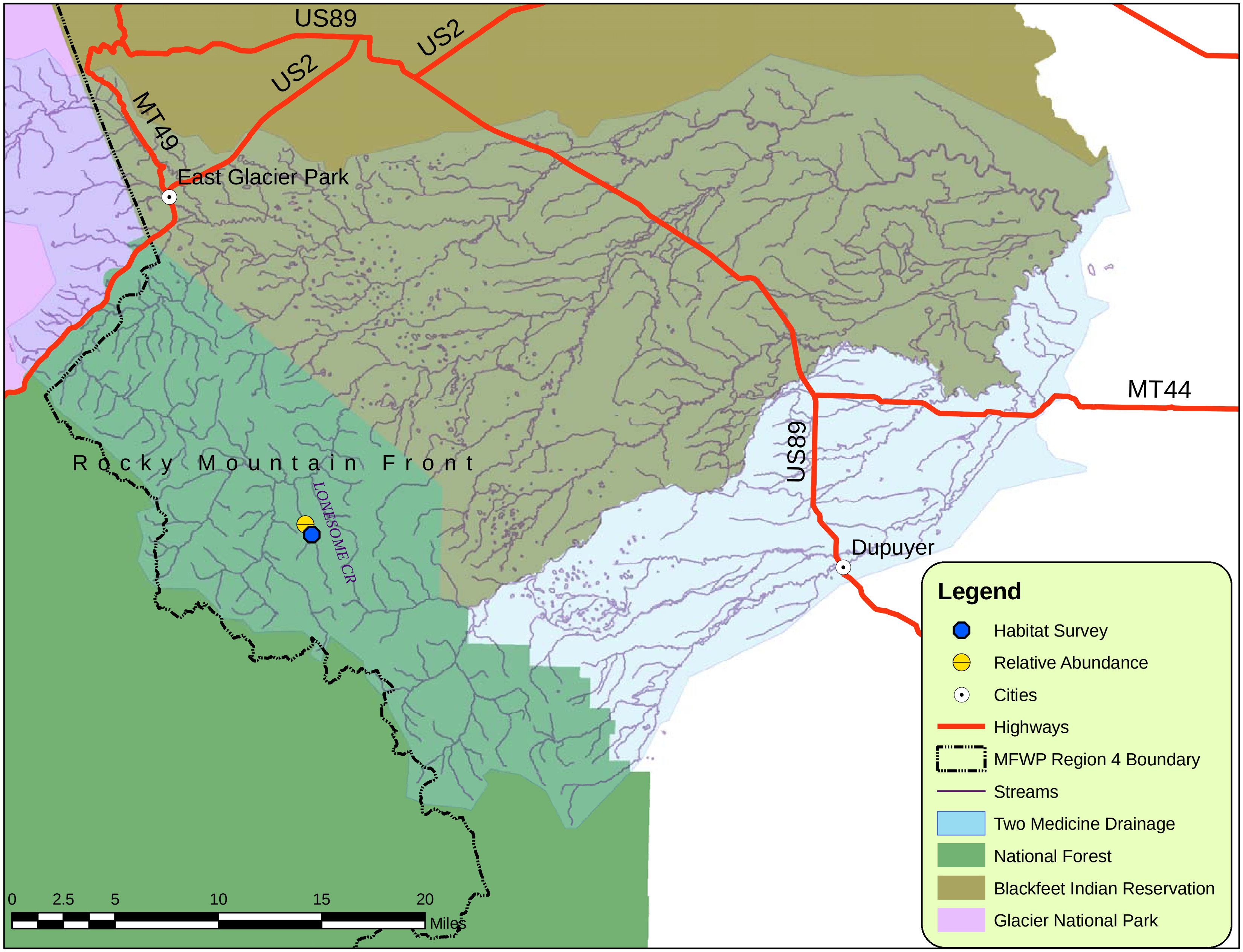

Figure 14. Two Medicine Drainage location and sampling sites, 2004.

Two Medicine Drainage (4th Code HUC 10030201)

Major accomplishments related to WCT restoration in the Two-Medicine Drainage included, a survey for presence of natural reproduction in the population of WCT in Lonesome Creek (transferred from Whiterock Creek in 2002 and 2003).

Lonesome Creek On 31 August 2004, an approximately 300 m long section of stream in the vicinity of previously translocated WCT (50 fish 2002 and 50 fish 2003 from Whiterock Creek) was electrofished in an upstream direction (Figure 14). Nine fish were captured which ranged between 79 and 250 mm (Appendix 7). Three of the fish captured (79, 80, 86 mm) represent recruitment from the 2002 translocation. Connected habitat in Lonesome Creek appears to be more limited than initially believed due to the presence of an unmapped barrier slide. The translocated WCT population will be monitored in future years for evidence of inbreeding depression. Should the small population suffer from genetic inbreeding small infusions of new individuals may be warranted.

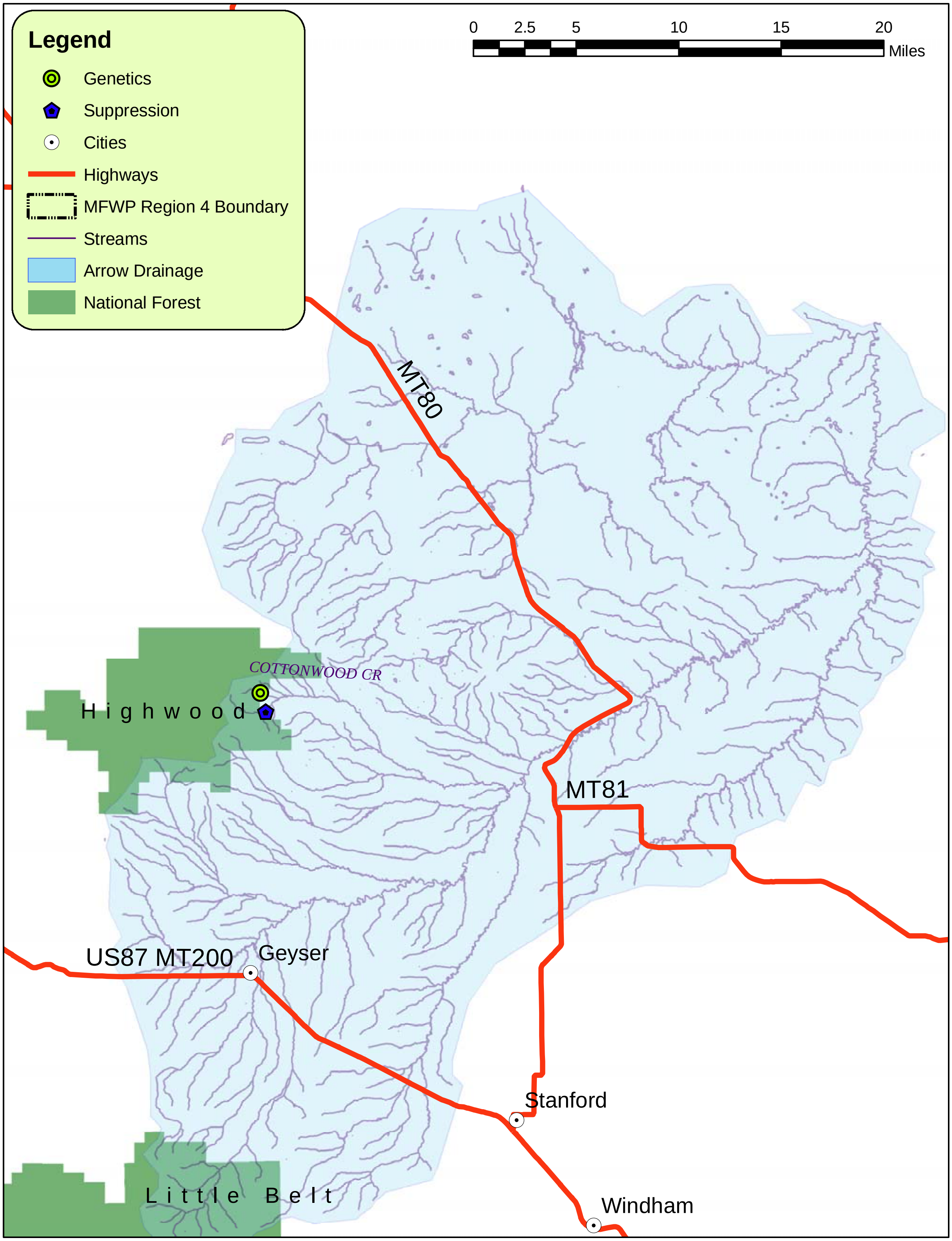

Figure 15. Arrow Creek Drainage location and sampling sites, 2004. Brook trout were suppressed in Cottonwood Creek.

Arrow Creek Drainage (4th Code HUC 10040102)

Major accomplishments related to WCT restoration in the Arrow Creek drainage included, eradication/suppression of EB in Cottonwood Creek and collection of genetic samples from Boyd Creek.

Cottonwood Creek Brook trout were suppressed/eradicated above a constructed barrier (2001) in about 4,000 m of Cottonwood Creek from 16-19 August 2004 and on 19 October 2004 (Figure 15; Appendix 7). Two to three crews electrofished 15 sections, each approximately 150 m in length. Sections were block netted and electrofished twice in an upstream direction. A small tributary just upstream of the barrier and the top 1,000 m of stream were electrofished with one pass. No brook trout were found over the length of stream electrofished and approximately 2,500 WCT were counted and measured (Appendix 7). Suppression/eradication will continue in 2005. If no EB are found in 2005, electrofishing may be limited to monitoring. The efficacy of using electrofishing equipment for EB eradication in this project and others will be published elsewhere.

Boyd Creek On 20 October 2004, 25 genetic samples were collected from a small allopatric population of WCT in the headwaters (upstream of the national forest boundary) of Boyd Creek (Figure 15). Boyd Creek enters Cottonwood Creek approximately 1,500 meters downstream of the constructed barrier on mainstem Cottonwood Creek. Five fish were collected from Boyd Creek in 1996 and analyzed for genetic purity (Appendix 7; Appendix 9). The allozyme analysis indicated the Boyd Creek fish were pure. Additional fish (25 PINE) were collected in 2004 to verify that fish are pure and if there are any restoration/protection opportunities. A cursory survey of the stream channel downstream of the forest boundary revealed there are no barriers to upstream fish movement. In addition spawning EB were seen approximately 200 m upstream from the mouth of Boyd Creek

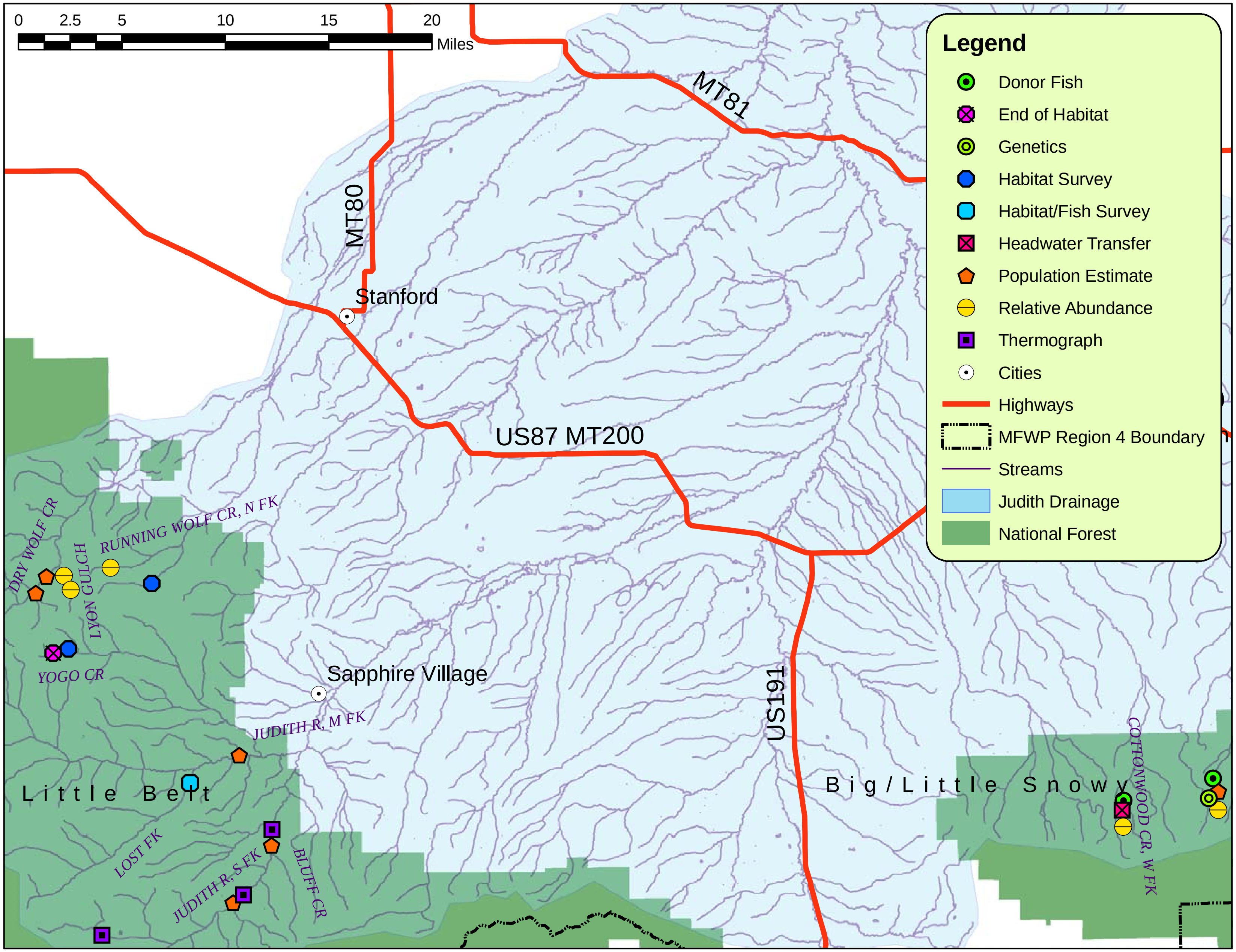

Figure 16. Judith Drainage location and sampling sites, 2004.

Judith Drainage (4th Code HUC 10040103)

Major accomplishments related to WCT restoration in the Judith River drainage included a transfer of genetically pure WCT from East Fork Big Spring Creek (Snowy Mountains) to North Fork Ford Creek (Rocky Mountain Front), a transfer of WCT from a tributary to West Fork Cottonwood Creek to previously fishless habitat in West Fork Cottonwood Creek (Snowy Mountains), fishery surveys of Dry Wolf Creek, Middle Fork Judith River, South Fork Judith River, Lyons Gulch, and North Fork Running Wolf Creek.

<u>Big Spring Creek, East Fork</u> On 3 August 2004, 109 WCT ranging from 61 - 241 mm total length (average 165 mm) were moved from East Fork Big Spring Creek (T14N R10E Sec16) to North Fork Ford Creek (T19N R9W Sec3) (Figure 16). WCT were collected on 2 August and transferred upstream about 1 mile to the helicopter-landing site. There appears to be just one marginal site where it is safe for a helicopter to land in the upper East Fork of Spring Creek. Tree clearing in this area is recommended prior to using the site in the future. The fish were transferred by helicopter and arrived at the introduction site in good condition. There is a good helicopter landing site in North Fork Ford Creek near the uppermost barrier falls It would be difficult to hike the WCT out from the remote sampling site in East Fork Spring Creek and then transfer by truck or helicopter. It took less than one hour to hike the fish up to the landing area.

East Fork Big Spring Creek had more water in August 2004 than in October 2003. In 2004, the WCT estimate of 36 fish per 100 m (Table 2; Appendix 7) was similar to the 34 per 100 m estimate in 2003 for WCT ≥ 100 mm (Moser et al. 2004). There is approximately 1.5 miles of high quality habitat in this stream. If we assume population numbers are similar throughout this reach there would be about 900 WCT ≥ 100 mm. Pool surveys with a mask and snorkel about 2 miles upstream of the donor site indicated there was about 1 large (>150 mm) WCT in every pool (about 4 per 100 m). East Fork Spring Creek likely contains about a mile of this type of peripheral habitat. Thus a general estimate of the total WCT (1+ or older fish) population in East Fork Big Spring Creek is 1,000 fish. This population estimate is primarily based on a 2-pass depletion estimate, which likely underestimates fish abundance. Peterson et al. (2004) found that 3 pass estimates underestimate populations by about 60% for WCT in small mountain streams, so the total number of WCT in East Fork prior to the transfer likely exceeded 1,000. In addition, there is little evidence of any angler exploitation of this population. An additional transfer is planned for 2005.

Thirty WCT from East Fork Big Spring Creek were sampled for disease in 2003. The results were typical for mountain streams in northcentral Montana; WCT were negative for all diseases except they scored low positive for ELISA readings for bacterial kidney disease. Trout from Ford Creek, downstream of the barrier where the WCT were transferred, also had positive ELISA values for bacterial kidney disease.

<u>Cottonwood Creek, West Fork</u> On 22 September 2004, 88 WCT were moved from a tributary of West Fork Cottonwood Creek to 1 mile of fishless habitat above a series of barriers on West Fork Cottonwood Creek (Figure 16; Appendix 7). Fish were carried across an approximately ¼ mile saddle separating the drainages. Transferred fish ranged from 74 to 229 mm in length. The average size of fish transferred was 151 mm. Another transfer of fish is planned for 2005.

<u>Dry Wolf Creek</u> Surveys were completed on two sections of Dry Wolf Creek, a long-term monitoring section about 1 mile upstream of the Dry Wolf Campground and a new section about 0.5 miles upstream of the Dry Wolf Campground (Figure 16). The additional section was surveyed to obtain pre-project data at a stream restoration site. There were about 26 EB and WCT combined per 100 m in both sections. WCT were more common in the upstream section (Table 2). In July 2004, several hundred feet of Dry Wolf Creek underwent stream restoration. Gabions and log structures that were installed about 30 years ago were

replaced with rock vanes. The USFS completed this project as part of the Dry Wolf Stewardship program. Dry Wolf Creek is well armored with large substrate in the restoration section so there was little apparent disturbance to the creek immediately after the work was completed. Downstream of the restored reach, in and near the campground, there are several gabion structures that still need to be removed and/or replaced. WCT appear to be maintaining their population in Dry Wolf Creek without active EB suppression, but the status of this fishery will continue to be monitored.

<u>Judith River, Middle Fork</u> A population estimate was completed on 27 September 2004 about 1 mile upstream of the mouth of Yogo Creek and downstream of the first 4 X 4 road crossing (Figure 16). Trout numbers were extremely low at 12 rainbow trout (*Oncorhynchus mykiss* sp.*)* and 5 brook trout per 100 m (Table 2). Two side-by-side backpack shockers appeared adequate to electrofish this section, but several pools upstream were too deep to electrofish with this equipment. In 1988, trout numbers in this area were slightly higher with 16 rainbow trout and 4 brook trout per 100 m (MFWP 1989). The only stream in the Lewistown Area with a lower trout population estimate was Collar Gulch, a small 1 cfs stream with acid drainage problems and a conductivity of 20 μS (Table 2). The Middle Fork Judith is the largest stream that was sampled during WCT work in 2004. It has an instream flow reservation of 22 cfs, and a conductivity of 150 μS. Therefore, this stream appears to have the potential for much higher trout numbers. For example, the South Fork Judith only has 3.5 cfs water reservation but had 2 - 3 times the number of trout (Table 2). When completing our population surveys we noted a layer of sediment on the rocks throughout the stream (more than 20 road fords exist upstream of the survey site). The crossings do have a hardened bottom but the approaches are continuously disturbed by vehicles and provide sediment input during rain events. The USFS identified the crossings as sediment sources and of hydrologic concern in the Judith DEIS (USDA 2003).

<u>Judith River, Lost Fork of Middle Fork</u> On 27 September 2004, we investigated the mouth of the Lost Fork of the Judith to evaluate barrier construction opportunities (Figure 16). The 0.25 mile reach above the mouth of the Middle Fork has some marginal possibilities for construction of a large and expensive barrier. Further upstream, the Lost Fork is located in a wide valley where it would be much more difficult to construct a barrier. Brook trout up to 292 mm and rainbow trout up to 163 mm were captured during spot electrofishing (Appendix 7).

<u>Judith River, South Fork</u> Twenty-five *Oncorhynchus* sp. (whole fish) were taken for allozyme genetic analysis from each of two sections on the South Fork Judith on 23 June 2003, to evaluate the genetic structure of the trout population prior to the planned barrier construction immediately downstream of Bluff Mountain Creek. Rainbow trout were the most common species found immediately above the barrier. Hybrid rainbow were more common at the section 2 miles upstream (Appendix 8; 12). A few individuals had only WCT alleles. The planned barrier will be for native WCT trout restoration (USDA 2004). These results make it clear that trout removal will be necessary several miles upstream to achieve the desired result of a 95% pure WCT population. Very hybridized *Oncorhynchus* sp. appear to be moving into at least one tributary, Deadhorse Creek in the South Fork Judith (Wright and Leary 2004). Design and engineering of the barrier should be completed in June of 2005. NEPA was completed in 2004 (Decision Notice - FONSI, 2 April 2004). Funding for the barrier was obtained in 2003 from the Future Fisheries program of MFWP, American Fisheries Society Montana Chapter, and the Montana Trout Foundation. After barrier construction in late summer/early fall of 2005, analysis will be completed on restoration options (removal of non-native fishes) and an EA will be drafted in 2005/2006.

A population estimate was also completed above Bluff Mountain Creek in mid-October. Shocking was difficult due to the start of stream ice-up. A total of 61 *Oncorhynchus* sp. were found per 100 m (Table 2), which is slightly higher than the 51 estimated in August 2002 (Moser et al. 2003). Mean length decreased slightly from 157 to 150 mm between 2002 and 2004. Two EB were also captured. Several brook trout were captured further upstream in 2002 (Moser et al. 2003).

A population estimate was also completed below Dry Pole Creek on 14 October 2004 (Figure 16). Mountain whitefish numbers were above average with 14 per 100 m compared with the historical mean of 11, and *Oncorhynchus* sp. numbers were similar to the record high year of 2001. The majority of trout in this reach are rainbow trout. Two EB and four trout that looked like WCT were captured in 2004 (Table 2; Figure 17; Appendix 7).

Temperature data obtained in 2004 from thermographs placed in the South Fork Judith downstream of Big Hill Creek, Bluff Mountain Creek, and Dry Pole Creek is displayed in Appendix 2. As in past years (Moser et al. 2004) temperatures increased going downstream (Appendix 2). In 2004, temperatures were lower than in 2003. Below Dry Pole the maximum daily temperature was 23.7˚ C on 15 July. The mean temperature for July was 14.4˚ C compared with 16.3˚ in 2003. Water temperature in 2003 reached 25˚ C (potentially lethal temperatures for many salmonids) (Moser et al. 2004).

<u>Lyons Gulch</u> Two sections of Lyons Gulch were sampled in 2004. A lower section had 18 EB per 100 m of stream (Figure 16). Sampling in 1995 showed Lyons Gulch supported approximately 20 EB and 9 WCT per 100 m of stream (genetic testing showed fish to be 89% WCT and 11% YCT). In 2004, a new upper section was sampled. Densities of WCT were 3 per 100m and densities of EB were 10 per 100 m (Appendix 7). Total abundance and relative numbers of WCT have dropped significantly since 1995. These declines can likely be attributed to drought and competition with EB.

<u>Running Wolf Creek, North Fork</u> Stream sampling in mid-October indicated that there were insufficient WCT numbers for a transfer to North Fork Ford Creek. Forty-two fish were sampled in 120 m of stream (Table 2; Appendix 7), which was about twice what was found in 2003 (Moser et al. 2004). The population estimate was 19 fish ≥ 100 mm and 31 fish ≥ 75 mm per 100 m. There is approximately one mile of WCT habitat in this stream, which means there may be approximately 300 fish exceeding 100 mm in North Fork Running Wolf Creek. We had hoped there would be numerous YOY that could be transferred but few were found. Temperatures were recorded from 29 June to 12 October 2004 (Appendix 2). The average daily temperature was 7.9˚C and the maximum temperature observed was 14.3˚ on 5 August. Average daily temperature in July was 8.8˚C (Appendix 2).

<u>Yogo Creek</u> On 28 September 2004 upper Yogo Creek was evaluated to determine suitability for a WCT transfer (Figure 16). In 2003, Yogo Creek was fishless upstream of a small barrier near Lead Gulch. Brook trout and WCT were common downstream of the barrier. The barrier did not look like it would completely block WCT passage and has an overflow channel. Above the barrier, Yogo Creek is fairly straight, high gradient, with few large pools and extensive evidence of historic placer mining activity, which has likely altered the channel. Of the 3 barriers noted in 2003, the one near Lead Gulch appears to be the largest. There is about 1 mile total habitat but the lack of woody debris may indicate significant spring flows with high velocities, one explanation of the absence of fish above the partial barriers. The small amount of habitat, the lack of woody debris and the small size of the barriers indicate upper Yogo Creek is a poor candidate for transfer of wild WCT.

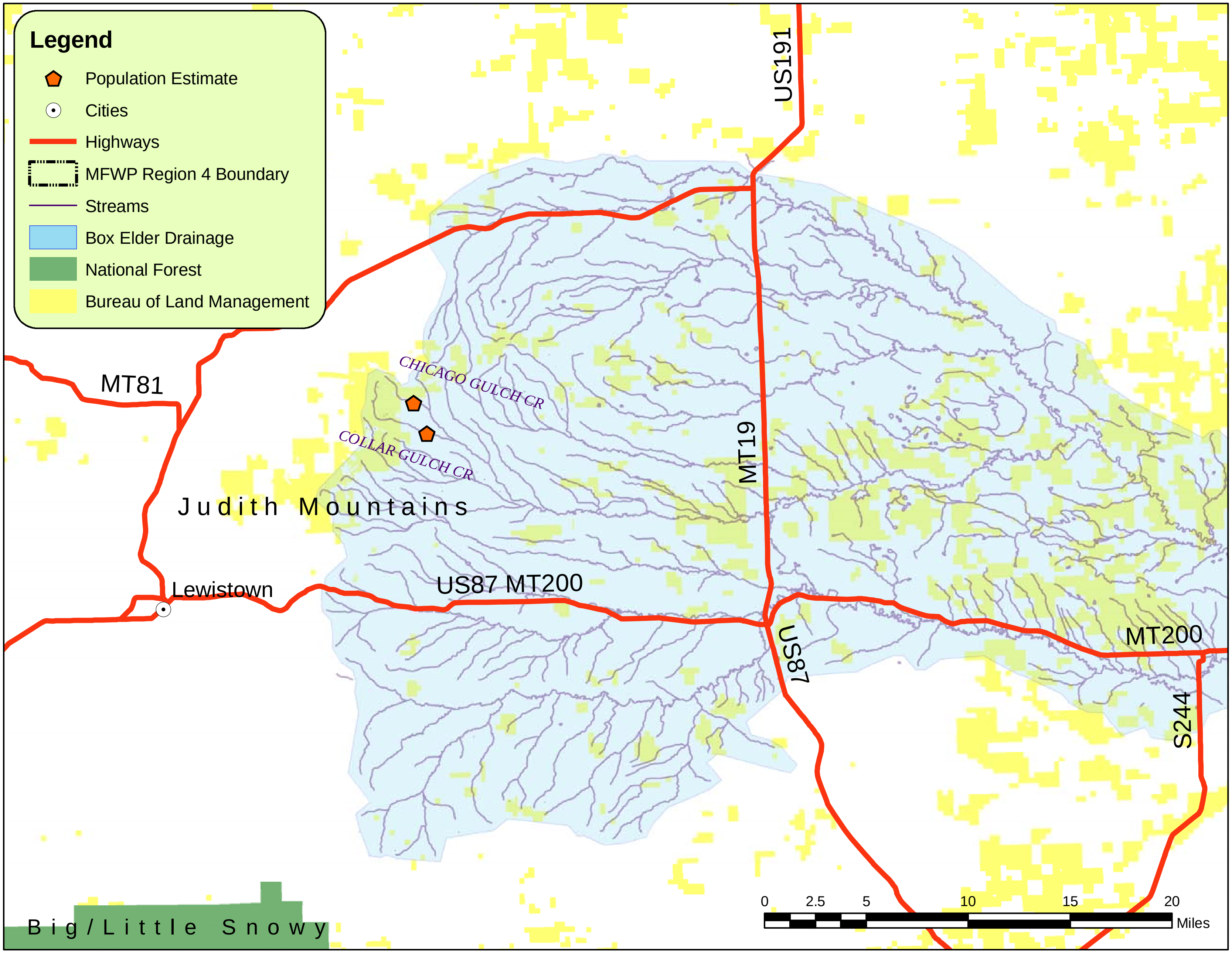

Figure 17. Box Elder Drainage location and sampling sites, 2004.

Box Elder Drainage (4th Code HUC 10040204)

Accomplishments related to WCT restoration in the Box Elder Drainage included fisheries surveys of Collar Gulch and Chicago Gulch.

<u>Collar Gulch</u> Collar gulch contains pure WCT. Sixteen WCT tested in 1981 and 27 tested in 2001 were genetically pure WCT. There are no known records of stocking (Shepard et al. 1996). A population estimate completed on 9 September 2004 found about 18 WCT ≥ 100 mm per 100 m (Figure 17). In addition, there were 59 WCT ≥ 75 mm per 100 m. Shepard et al. (1996) found large variability in size structure between years during an extensive study on Collar Gulch from 1993 - 1995. During base-flow conditions (about 1 cfs) Collar Gulch flow goes subsurface providing less than 2 miles of habitat and Shepard et al. (1996) found the majority of fish in 1 mile of stream. Collar Gulch has a history of water quality problems. The upper reaches of this stream are fishless due to acidic conditions. In addition, stream substrates are covered with a white precipitate caused by acidic conditions (Appendix 11). An informal report noted that pH in the upper reaches of Collar Gulch are as low as 4 due to man-made and natural pyrite outcrops (Jones et al. 1996). Spot electrofishing indicated numerous WCT immediately upstream of a wood crib. Collar Gulch is a Bureau of Land Management (BLM) area of critical environmental concern and the easternmost known WCT population. In 2004, the BLM applied for funding to evaluate acid drainage in both Collar and Chicago Gulch and to remove the wood crib (Appendix 11).

<u>Chicago Gulch</u> The upper reaches of Chicago Gulch have a white precipitate due to acidic conditions. Chicago Gulch is perennial downstream to private land and during base-flow ends in a series of massive beaver ponds (Figure 17; Appendix 11). This stream only contains brook trout with a population estimate of 157 per 100 m for fish ≥ 100 m. This estimate is almost 10 times higher than WCT in nearby Collar Gulch (Table 2). We are evaluating the possibilities of replacing brook trout in Chicago Gulch with Collar Gulch and/or Halfmoon Canyon WCT. Eradication of brook trout on private property would be necessary.

Flatwillow Drainage (4th Code HUC 10040203)

<u>Half Moon Creek</u> Habitat for the genetically-pure population of WCT in Half Moon Creek has been improving since the range pasture was closed and livestock removed in 2002 (no drainage map provided). Trampled streambanks are revegetating and stabilizing. A riparian exclosure fence constructed around part of the stream in 1998 was dismantled in 2004. Monitoring is needed to check for any livestock trespass that may be occurring from adjacent allotments. The Half Moon Creek WCT population occupies about 5 miles of headwater habitat which is isolated for most of the year by a dewatered stream reach below the National Forest boundary. However, there is a possibility of a fluvial connection to downstream non-native trout (including rainbow trout) during a major runoff event because there are no other known physical barriers to fish passage.

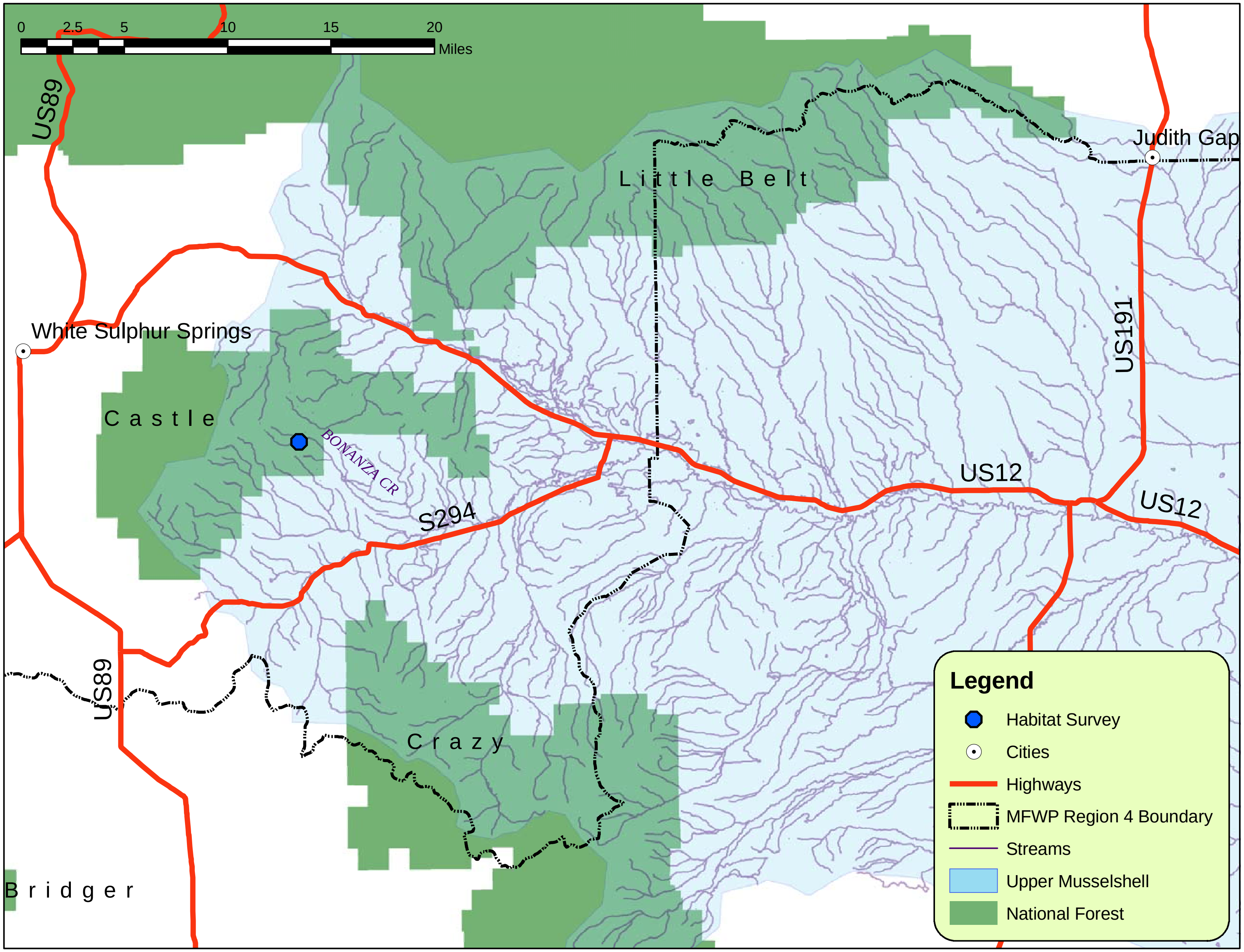

Figure 18. Upper Musselshell location and sampling sites, 2004.

Musselshell (4^{th} Code HUC 10040201)

Accomplishments related to WCT restoration in the Upper Musselshell Drainage included a fisheries survey of Bonanza Creek.

Bonanza Creek, South Fork This stream is fishless above a waterfall located at T8N R9E Sec5. Temperatures were taken from 7 July to 27 September about 0.5 miles downstream of the USFS road 581 (Figure 18). Overall mean temperature was 8.8˚ C with a daily maximum of 17.1˚ F on 15 July (Appendix 2). Daily temperature fluctuations often exceeded 15˚ F. On 28 September 2004, the stream above the barrier was electrofished for 20 minutes and no fish were observed. Below the waterfall, electrofishing was done for about 8 minutes and 2 rainbow and 4 brook trout were captured.   The entire fishless stream reach was walked to determine suitability for a WCT transfer. No fish were observed. The ¾ mile immediately downstream of the road crossing has good riparian vegetation of grass and willows, and is protected by electric fencing. This reach was low gradient and pools did not exceed 1 ft. depth. Discharge was not measured but was likely less than 1 cfs. From the bottom of the fenced section to the fish barrier is about ¾ mile. Livestock impacts were noted. This section has a higher gradient and is dominated by step pools. Springs increased flow to about twice that at the road crossing. All of the pools were less than 2 ft. deep. There is approximately one mile of potential fish habitat. The majority of substrate in the fishless reach was composed of large cobble and silt. The upper section was silty and fines predominated in the tail-outs of the pools in the lower section. This stream appears to be too small for WCT and is very silty so it is not recommended as a transfer site.

Table 2. Depletion removal estimates for fish ≥ 100 mm from northcentral Montana streams in 2004.

Stream **Legal** **Site** **Section length (m)**	**Date**	**Species**	**#/100 m** **(95% CI; lower CI set at catch)**	**Average total length fish ≥ 100m (mm)**	**Probability of capture**
Chamberlain Creek T13N R8E S2 Lower (100 m)	7/27/2004	WCT EB	16 (16-17) 11 (11-12)	152 168	3 - pass
Chamberlain Creek T13N R8E S2 Upper (200 m)	7/27/2004	WCT	26 (26-27)	165	0.89
Chicago Gulch T17N R20E S27,28 (100 m)	9/8/2004	EB	156 (156-163)	127	0.81
Collar Gulch Upstream Trail T17N R20E S32 (190 m)	9/7/2004	WCT	19 (19-20)	136	0.95
Cottonwood Creek T8N R7E S23 Upstream of E. Fk. (100 m)	7/13/2004	WCT	26 (26-27)	170	0.96
Cottonwood Creek T8N R7E S23 Near E. Fk. (130 m)	7/13/2004	WCT	5 (5-6)	167	0.86
Cottonwood Creek T8N R7E S14 Upper (100 m)	7/13/2004	WCT	8 (8)	141	8 fish first pass
Dry Wolf Creek T14N R9E S13 Pre-restoration (204 m)	7/20/2004	WCT EB	15 (15-16) 11 (11-12)	163 154	0.89 0.88
Dry Wolf Creek T14N R9E S13 Index Site (220 m)	7/20/2004	WCT EB	11 (11-12) 14 (14-14)	185 157	3-pass 3-pass
East Fork Big Spring Creek T12N R19E S4 (134 m)	8/2/2004	WCT	36 (36-39)	159	0.87
Lake Creek T11N R7E S25 (100 m)	6/24/2004	RBT X WCT X YCT	15 (15-18)	158	3 -pass
Middle Fork Judith T13N R11E S33 NE (300 m)	9/27/2004	RBT &WCT EB	12 (12-14) 5 (5-6)	176 159	0.80 0.88
Middle Fork Judith	1988 (from MFWP 1989)	RBT EB	16 (+/-) 7 4	208 178	- -

Stream **Legal** **Site** **Section length (m)**	**Date**	**Species**	**#/100 m** **(95% CI; lower CI set at catch)**	**Average total length fish ≥ 100m (mm)**	**Probability of capture**
North Fork Running Wolf T14N R10E S16 (120 m)	10/13/2004	WCT	19 (19-20)	130	0.92
Petty Creek T19N R9E S24 At Crossing	8/20/2004	WCT	11 (11-13)	170	0.85
South Fork Judith T12N R11E S23 Below Dry Pole (200 m)	10/14/2004	RBT and RBT X WCT EB Mountain whitefish Longnose sucker	33 (33-34) 1 14 (14-15) 1	173 172 157 196	0.92 2 fish first pass 0.94 2 fish first pass
South Fork Judith T12N R11E S23 Above Bluff Mtn. Creek (175 m)	10/26/2004	RBT and RBT X WCT EB Mountain whitefish	61 (61-63) 1 2	146 154 265	3 - pass 1 fish first pass 4 fish last pass

WCT=westslope cutthroat trout; RBT=rainbow trout; EB=eastern brook trout

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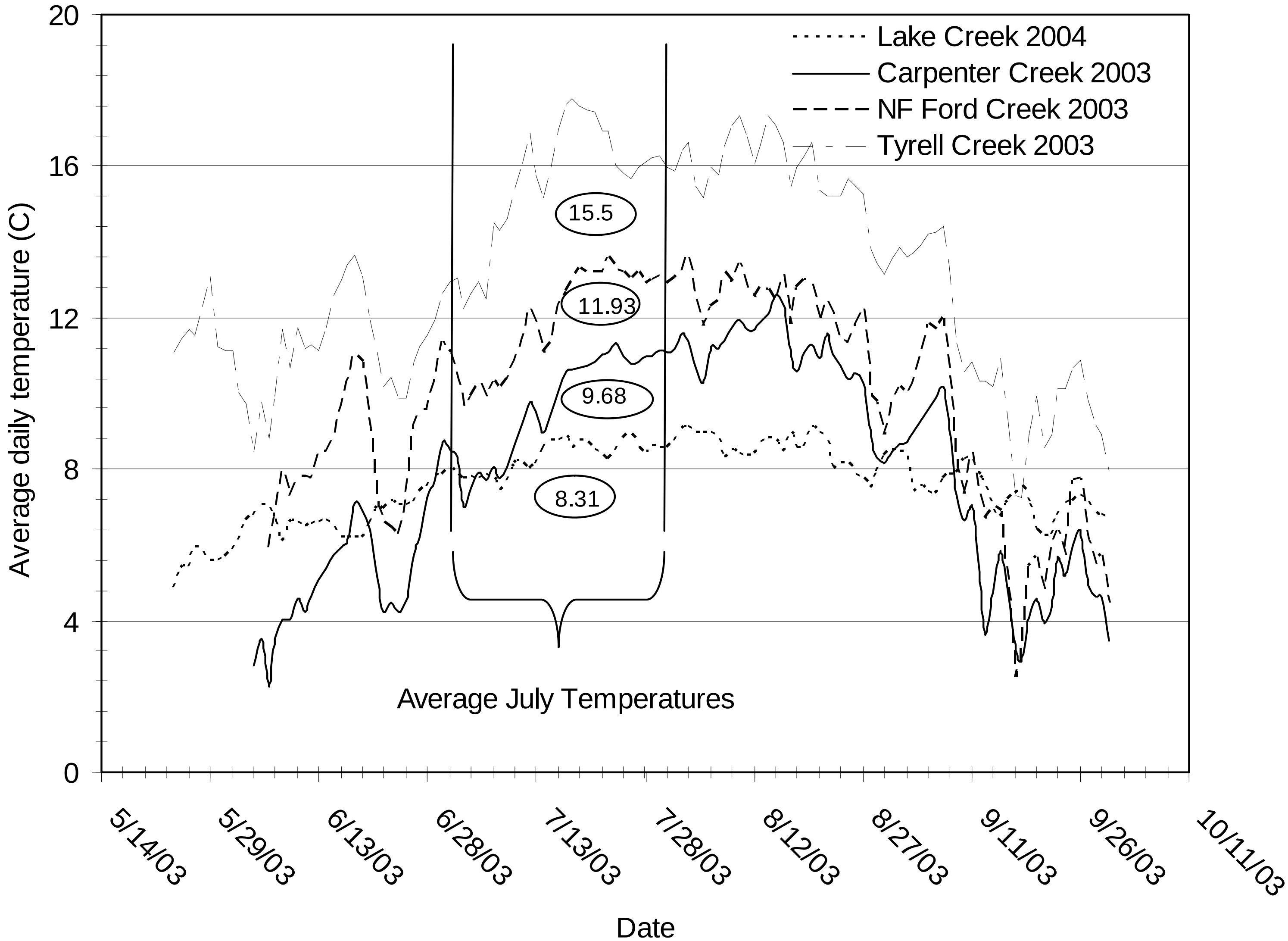
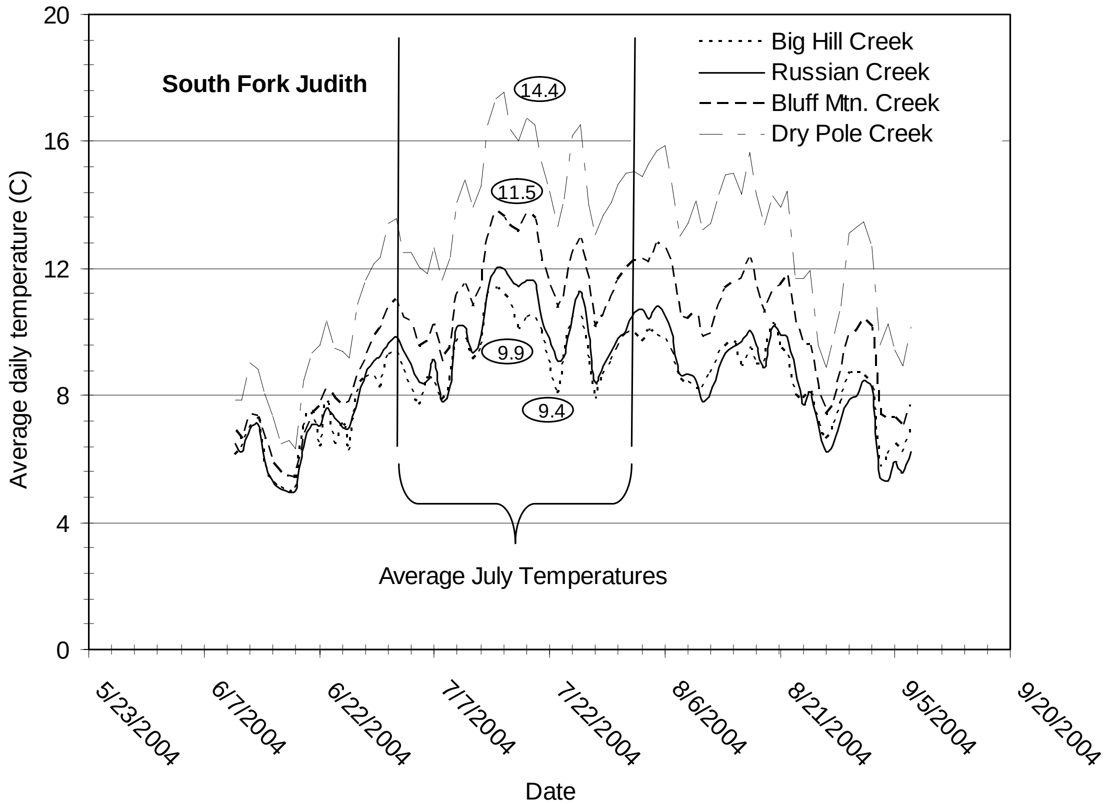
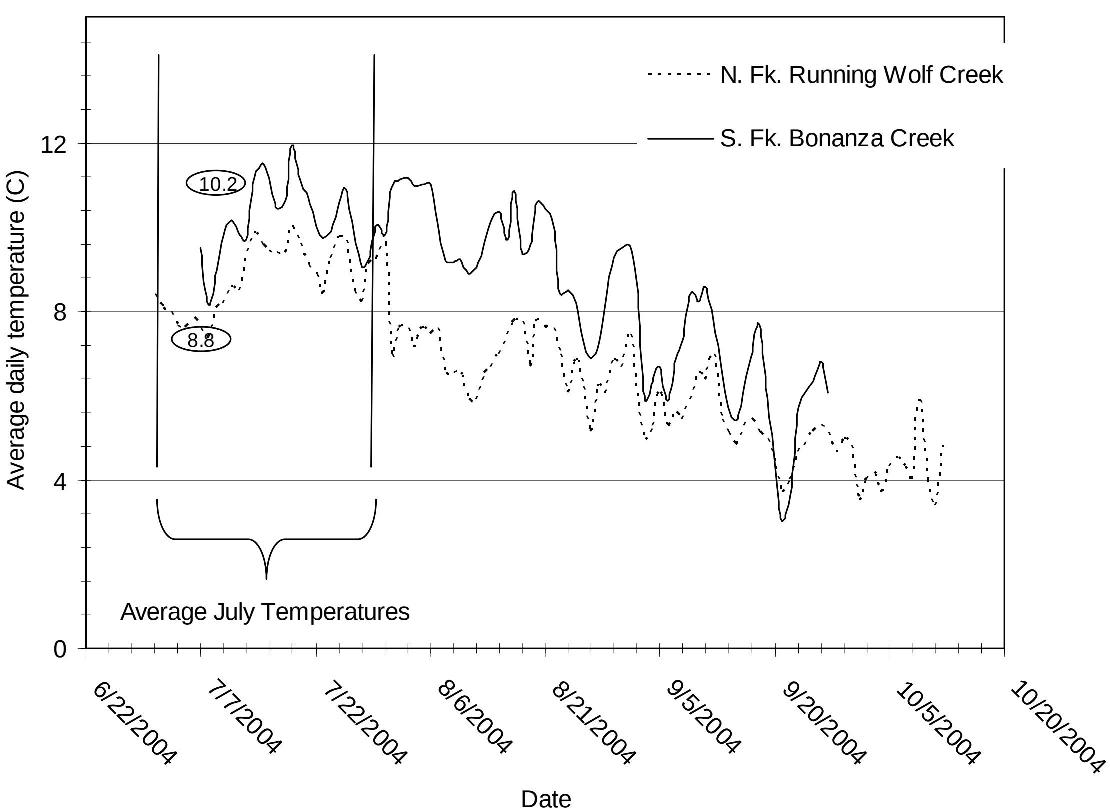


Appendix 1. Average daily water temperature in Lake Creek, Carpenter Creek, N. Fk. Ford Creek, and Tyrell Creek, 2003 and 2004.





Appendix 2. Average daily water temperature at four locations on the South Fork Judith River (upper plot), N. Fk. Running Wolf, and S. Fk. Bonanza creeks (lower plot), 2004.

Appendix 3. Decrease in miles of stream in 2004 with genetically pure WCT. Decreases in Horn, Tillinghast, and Snow creeks are based on lack of barriers and proximity to observed rainbows and highly hybridized fish.

Drainage	Stream	Activity	Miles	Purity
Belt				
	Harley Cr., Upper	New Data	-1.00	98.00%
	Horn Cr.	New Data (No Barrier)	-2.00	<100.00%
	Tillinghast Cr.	New Data (No Barrier)	-5.00	<100.00%
			-8.00	
Judith				
	Snow Cr.	New Data (No Barrier)	-0.50	<100.00%
			-0.50	
Grand Total			**-8.50**	

Appendix 4. Increase in miles of stream in 2004 with genetically pure WCT. With the exception of Palisade Cr. (10) sample sizes are ≥ 25 (95% chance of detecting 1% of introgression).

Drainage	Stream	Activity	Miles	Purity
Belt				
	Crawford Cr.	Confirmed Pure WCT	+1.00	100.00%
	Palisade Cr.	New Stream Site Pure	+1.00	100.00%
			+2.00	
Judith				
	Cottonwood Cr., W. Fk.	Replicated Population	+1.50	100.00%
			+1.50	
Smith				
	Jumping Cr.	Confirmed Pure WCT	+2.00	100.00%
			+2.00	
Sun				
	N. Fk. Ford Cr.	Replicated Population	+1.50	100.00%
			+1.50	
Grand Total			**+7.00**	

Appendix 5. Miles of stream in 2004 with pure or nearly pure WCT. Fish tested as greater than 99.5% and less than 100% WCT were not included in Table 1 accounting. Symbols indicate streams which have substantial protection from introgression: £ = manmade barrier, ¥ = mining effluent barrier, ¤ = falls barrier, Ø = dry channel barrier.

Drainage	Stream	Miles	Genetic Purity
Arrow			
	Boyd Cr.	1.00	100.00%
	Cottonwood Cr.	(£) 2.00	100.00%
		3.00	
Belt			
	Belt Cr., Upper	6.00	100.00%
	Bender Cr.	0.50	100.00%
	Carpenter Cr.	(¥) 3.00	100.00%
	Chamberlain Cr.	(£) 5.00	100.00%
	Crawford Cr.	1.00	100.00%
	Gold Run Cr.	(¤) 3.00	100.00%
	Gold Run Cr., Upper	(¤) 0.25	100.00%
	Gold Run Cr., Upper, Upper	(¤) 0.25	100.00%
	Graveyard Gulch	1.50	100.00%
	Harley Cr., Upper, Trib.	1.00	100.00%
	Little Belt Cr., M. Fk.	1.00	100.00%
	Little Belt Cr., M. Fk., Upper	(£) 1.00	100.00%
	Little Belt Cr., N. Fk., Lower	(¤) 1.00	100.00%
	Little Belt Cr., N. Fk., Upper	(¤) 1.50	100.00%
	Logging Cr.	2.00	100.00%
	O'Brien Cr.	(¤) 2.25	100.00%
	Palisade Cr.	1.00	100.00%
	Pilgrim Cr., Upper	5.00	100.00%
	Shorty Cr.	1.00	100.00%
		37.25	
Highwood			
	Big Coulee Cr.	(£) 2.00	100.00%
		2.00	
Judith			
	Big Hill Cr.	2.00	99.70%
	Cottonwood Cr., W. Fk.	(Ø) 1.50	100.00%
	Cottonwood Cr., W. Fk., Upper	(¤) 1.00	100.00%
	Running Wolf Cr., N. Fk	(Ø) 1.50	100.00%
	Big Spring Cr., E. Fk.	(Ø) 2.50	100.00%
		8.50	
Musselshell			
	Collar Gulch	(Ø) 2.00	100.00%
	Half Moon	(Ø) 5.00	100.00%
		7.00	
Smith			
	Cottonwood Cr., E. Fk & W. Fk.	(Ø) 4.50	100.00%
	Daniels Cr.	3.00	99.60%
	Deadman Cr. N. Fk.	1.50	100.00%
	Deep Cr., N. Fk	(Ø) 2.00	100.00%

Drainage	Stream	Miles	Genetic Purity
	Deep Cr., N. Fk, Upper	(¤) 2.00	100.00%
	Four mile Cr., Upper	(¤) 1.00	100.00%
	French Cr., Lower/Upper	1.50	100.00%
	Jumping Cr.	2.00	100.00%
	Mid Camas Cr.	(¤) 1.50	100.00%
	Richardson Cr.	1.50	100.00%
		20.50	
Sun			
	N. Fk. Ford Cr.	(¤) 1.50	100.00%
	Petty Cr.	(¤) 3.00	100.00%
		4.50	
Teton			
	Green Gulch, Upper	2.00	100.00%
	Rierdon Gulch, Upper	2.00	100.00%
	Willow Cr., N. Fk.	1.50	100.00%
		5.50	
Two Medicine			
	Badger Cabin Cr.	(¤) 2.00	100.00%
	Birch Cr., S. Fk.	(¤) 4.00	100.00%
	Dupuyer Cr., M. Fk., Above Dam	(£) 0.62	100.00%
	Dupuyer Cr., S. Fk., Upper	(¤) 1.40	100.00%
	Lonesome Cr.	(¤) 2.00	99.60%
	Midvale Cr.	(£) 4.00	100.00%
	North Badger Cr.	(¤) 20.00	100.00%
	Red Poacher Cr.	(¤) 2.00	100.00%
	Rival Cr.	(¤) 0.50	100.00%
	Sidney Cr. , Above Barrier	(¤) 1.00	100.00%
	South Badger Cr.	(¤) 1.00	100.00%
	Whiterock Cr.	3.00	99.60%
		41.52	
Upper Missouri			
	Page Gulch	1.50	100.00%
	Rooster Bill	2.00	100.00%
	Skelly Gulch	(£) 3.50	100.00%
	Three Mile Cr.	(£) 5.00	100.00%
		12.00	
Grand Total		**141.77**	

Appendix 6. Modifications in purity and miles of stream that support westslope cutthroat populations in 2004. Changes are based on new genetic results, changes in miles of stream, and new translocated populations.

Drainage	Stream	Activity	Miles 2000	Purity 2000	Date	Miles Current	Purity Current	Date
Belt								
	Crawford Cr.	Confirmed Pure WCT				1.00	100.00%	2003
	Harley Cr., Upper	Decrease From Pure Because of New Data	1.00	100.00%	1996	1.00	98.00%	2003
	Horn Cr.	Decrease From Pure Because of New Data (No Barrier)	2.00	100.00%	Assumed	2.00	95.00%	Assumed
	Palisade Cr.	New Stream Site Pure				1.00	100.00%	2003
	Tillinghast Cr.	Decrease From Pure Because of New Data (No Barrier)	5.00	100.00%	1996	5.00	95.00%	2004
			8.00			**10.00**		
Judith								
	Cottonwood Cr., W. Fk.	Replicated Population				1.50	100.00%	2002
	Deadhorse Cr., Trib.	New Stream Site Less Than Pure				0.50	<100%	2003
	Harrison Cr., Upper, Trib.	New Stream Site Less Than Pure				0.50	<100%	2004
	Judith River, S. Fk. Lower	Decrease From Less Than Pure Because of New Data				2.00	45.00%	2003
	Judith River, S. Fk., Upper	Distance Change Because of New Data	11.00	98.00%	1997	9.00	97.50%	2000
	Snow Cr.	Decrease From Pure Because of New Data (No Barrier)	0.50	100.00%	1994	0.50	95.00%	Assumed
			11.50			**14.00**		
Smith								
	Jumping Cr.	Confirmed Pure WCT				2.00	100.00%	2004
	Tenderfoot Cr., S. Fk.	Decrease From Less Than Pure Because of New Data	4.00	96.00%	1998	4.00	95.70%	2003
			4.00			**6.00**		
Sun								
	N. Fk. Ford Cr.	Replicated Population				1.50	100.00%	2002
						1.50		
Two Medicine								
	Dupuyer Cr., M. Fk., Above	Confirmed Pure WCT	2.00	100.00%	1997	0.62	100.00%	2003
	Dupuyer Cr., N. Fk.	Decrease From Less Than Pure Because of New Data	8.00	95.00%	1990	3.40	92.00%	2003
	Dupuyer Cr., S. Fk., Lower	Decrease From Less Than Pure Because of New Data	2.00	94.00%	1994	2.00	87.00%	2003
	Dupuyer Cr., S. Fk., Upper	Confirmed Pure WCT	3.00	100.00%	Transfer	1.40	100.00%	2003
	Lost Shirt Cr.	Increase From Less Than Pure Because of New Data	2.00	92.00%	1993	2.00	93.00%	2002
	Midvale Cr.	Confirmed Pure WCT			2004	4.00	100.00%	
			17.00			**13.42**		
Grand Total			**40.50**			**44.92**		

Appendix 7. Statistics of fish captured during stream surveys in 2004. CPUE (m) and CPUE (hr) calculated from 1st pass samples. Minimum, maximum, and averages calculated from total catch (all fish). Samples were collected by MFWP and the USFS.

Sampling Site	Date	Length (m)	Seconds Sampled	Species	N	Min	Total Length (mm) Max	Avg	CPUE (m) 100	CPUE (hr) 1
Big Camas Cr., Sec. 1, Relative Abundance		319	950	EB	26	100	240	164	8.2	98.5
T9N R3E sec16		319	950	HYB	6	110	205	160	1.9	22.7
	9/7/04									
(Smith)										
Big Camas Cr., Sec. 2, Relative Abundance		2760	1287	HYB	30	80	235	149	1.1	83.9
T9N R3E sec17,18										
	9/7/04									
(Smith)										
Big Coulee, Tributary, Mark - Movement		-	-	No Fish	0	-	-	-	-	-
T20N R9E Sec10										
	7/12/04									
(Highwood)										
Big Coulee, Below New Barrier, Mark - Movement		50	-	EB	18	165	281	185	36.0	-
T20N R9E Sec10										
	7/12/04									
(Highwood)										
Big Coulee Cr., Barrier to Campsite, Sec. 1, Suppression		930	-	WCT	12	80	185	151	1.3	-
T19N R9E Sec10		930	-	EB	17	46	227	167	1.8	-
	7/12/04	930	-	LL	4	205	254	230	0.4	-
(Highwood)										
Big Coulee, Blasted Barrier to Campsite, Sec. 1, Suppression		650	7642	WCT	15	41	205	135	2.3	7.1
T20N R9E Sec10		650	7642	EB	18	79	171	99	2.8	8.5
	8/30/04									
(Highwood)										
Big Coulee, Sec. 2, Suppression		470	-	WCT	8	97	235	179	1.7	-
T20N R9E Sec10		470	-	EB	7	76	191	154	1.5	-
	8/31/04									
(Highwood)										
Big Coulee, Sec. 3, Suppression		400	4501	WCT	43	82	225	135	10.8	34.4
T20N R9E Sec10										
	9/1/04									
(Highwood)										
Big Coulee, Sec. 4, Suppression		495	5482	WCT	99	40	225	128	20.0	65.0

Sampling Site	Date	Length (m)	Seconds Sampled	Species	N	Min	Total Length (mm) Max	Avg	CPUE (m) 100	CPUE (hr) 1
T20N R9E Sec10 (Highwood)	9/1/04									
Big Coulee, Sec. 5, Suppression T20N R9E Sec11 (Highwood)	9/2/04	-	5827	WCT	9	90	235	158	-	5.6
Big Spring Cr. E. Fk., Population Estimate T12N R19E Sec9 (Judith)	8/2/04	134	-	WCT	125	58	241	145	93.1	-
Bonanza Cr., S. Fk., Below Waterfall, Relative Abundance T8N R9E Sec5 (Upper Musselshell)	9/28/04	134	-	RBT	2	119	259	188	-	-
		134		EB	4	102	142	124	-	-
Boyd Cr., Genetics/Relative Abundance T 20N R10E Sec32 (Arrow)	10/20/04	320	1151	WCT	26	100	148	122	8.1	81.3
Chamberlain Cr., Lower, Population Estimate T13N R8E Sec2 (Belt)	7/27/04	100	852	WCT	23	56	187	128	17.0	71.8
		100	852	EB	11	104	212	168	7.0	29.6
Chamberlain Cr., Upper, Population Estimate T13N R8E Sec2 (Belt)	7/27/04	150	2463	WCT	50	47	224	144	28.0	61.4
Chicago Gulch, Population Estimate T17N R20E Sec27,28 (Box Elder)	9/8/04	100	-	EB	313	51	193	97	-	-
Collar Gulch, Upstream 4 Wheel Drive Trail, Population Estimate T17N R20E Sec32 (Box Elder)	9/7/2004	190	-	WCT	115	46	178	99	-	-
Collar Gulch, Upstream Crib, Relative Abundance		-	-	WCT	11	66	152	97	-	-

Sampling Site	Date	Length (m)	Seconds Sampled	Species	N	Total Length (mm) Min	Max	Avg	CPUE (m) 100	CPUE (hr) 1
T17N R20E Sec32 (Box Elder)	9/7/2004									
Cottonwood Cr., Sec. 1, Suppression/Population Estimate T19N R10E Sec5 (Arrow)	8/16/04	130	-	WCT	198	90	260	128	152.3	-
Cottonwood Cr., Sec. 2, Suppression/Population Estimate T19N R10E Sec5 (Arrow)	8/16/04	190	4282	WCT	218	80	280	127	114.7	183.3
Cottonwood Cr., Sec. 3, Suppression/Population Estimate T19N R10E Sec5 (Arrow)	8/16/04	130	1746	WCT	69	34	178	118	53.1	142.3
Cottonwood Cr., Sec. 4, Suppression/Population Estimate T19N R10E Sec5 (Arrow)	8/17/04	140	1636	WCT	34	33	144	114	24.3	74.8
Cottonwood Cr., Sec. 5, Suppression/Population Estimate T19N R10E Sec5 (Arrow)	8/17/04	158	-	WCT	52	98	211	131	32.9	-
Cottonwood Cr., Sec. 6, Suppression/Population Estimate T19N R10E Sec5 (Arrow)	8/17/04	230	6275	WCT	217	36	258	126	94.3	124.5
Cottonwood Cr., Sec. 7, Suppression/Population Estimate T19N R10E Sec5 (Arrow)	8/17/04	89	-	WCT	30	99	204	131	33.7	-
Cottonwood Cr., Sec. 8, Suppression/Population Estimate T19N R10E Sec6 (Arrow)	8/18/04	188	2226	WCT	112	97	214	121	59.6	181.1
Cottonwood Cr., Sec. 9, Suppression/Population Estimate		150	3170	WCT	75	85	196	117	50.0	85.2

Sampling Site	Date	Length (m)	Seconds Sampled	Species	N	Min	Total Length (mm) Max	Avg	CPUE (m) 100	CPUE (hr) 1
T19N R10E Sec6 (Arrow)	8/18/04									
Cottonwood Cr., Sec. 10, Suppression/Population Estimate		180	4231	WCT	110	75	180	114	61.1	93.6
T19N R10E Sec6 (Arrow)	8/18/04									
Cottonwood Cr., Sec. 11, Suppression/Population Estimate		170	2256	WCT	102	82	184	112	60.0	162.8
T19N R10E Sec6 (Arrow)	8/18/04									
Cottonwood Cr., Sec. 12, Suppression/Population Estimate		170	2115	WCT	103	78	203	110	60.6	175.3
T19N R10E Sec6 (Arrow)	8/18/04									
Cottonwood Cr., Sec. 13, Suppression/Population Estimate		190	4657	WCT	232	62	211	109	122.1	179.3
T19N R10E Sec6 (Arrow)	8/19/04									
Cottonwood Cr., Sec. 14, Suppression/Population Estimate		150	2786	WCT	127	70	200	113	84.7	164.1
T19N R10E Sec6 (Arrow)	8/19/04									
Cottonwood Cr., Sec. 15, Suppression/Population Estimate		-	650	WCT	37	56	191	113	-	204.9
T19N R10E Sec6 (Arrow)	10/19/04									
Cottonwood Cr., Trib., Suppression/Population Estimate		1258	-	WCT	226	75	240	123	18.0	-
T19N R10E Sec5 (Arrow)	8/16/04									
Cottonwood Cr., E. Fk., Relative Abundance		-	1860	WCT	2	190	235	213	-	3.9
T8N R7E Sec23 (Smith)	7/13/04									
Cottonwood Cr., W. Fk., Low, Relative Abundance		455	6600	WCT	24	70	230	179	5.3	13.1

Sampling Site	Date	Length (m)	Seconds Sampled	Species	N	Total Length (mm) Min	Max	Avg	CPUE (m) 100	CPUE (hr) 1
T8N R7E Sec23 (Smith)	7/13/04									
Cottonwood Cr., W. Fk., Upstream of E. Fk., Population Estimate T8N R7E Sec23 (Smith)	7/13/04	100	1047	WCT	26	60	234	170	26.0	89.4
Cottonwood Cr., W. Fk., Population Estimate T8N R7E Sec23 (Smith)	7/13/04	130	1087	WCT	6	58	251	151	4.6	19.9
Cottonwood Cr., W. Fk., Upstream Trib., Relative Abundance T8N R7E Sec14 (Smith)	7/13/04	95	291	WCT	9	125	180	150	9.5	111.3
Cottonwood Cr., W. Fk. Upper, Population Estimate T8N R7E Sec14 (Smith)	7/13/04	100	685	WCT	18	58	162	97	18.0	94.6
Cottonwood Cr., Snowies, Transfer T12N R18E Sec13&14 (Judith)	9/22/04	100	1461	WCT	88	36	265	151	49.0	120.7
Daniels Cr., Lower, Relative Abundance T12N R7E Sec27 (Smith)	9/23/04	400	1994	HYB	11	170	260	210	2.8	19.9
		400	1994	EB	1	210	210	210	0.3	1.8
Dry Wolf Cr., Pre-Restoration, Population Estimate T14N R9E Sec13 (Judith)	7/20/04	219	-	HYB	25	124	274	185	-	-
		219	-	EB	33	58	213	152	-	-
Dry Wolf Cr., Standard Section, Population Estimate T14N R9E Sec13 (Judith)	7/20/04	204	-	HYB	33	56	287	155	-	-
		204	-	EB	27	81	213	140	-	-
French Cr., Lower, Relative Abundance		-	591	HYB	28	70	230	146	-	170.6

Sampling Site	Date	Length (m)	Seconds Sampled	Species	N	Min	Total Length (mm) Max	Avg	CPUE (m) 100	CPUE (hr) 1
T12N R1E sec23										
	9/13/04									
(Smith)										
French Cr., Upper, Genetics/Relative Abundance		-	499	WCT	25	80	220	143	-	180.4
T12N R1E sec15										
	9/13/04									
(Smith)										
Gold Run Cr., Expansion Sec., Relative Abundance		-	482	WCT	9	50	240	135	-	67.2
T15N R8E sec18										
	9/21/04									
(Belt)										
Horn Cr., Mid, Relative Abundance		175	666	No Fish	3	111	144	123	1.7	16.2
T14N R7E Sec8										
	7/29/04									
(Belt)										
Horn Cr., Upper Trib., Relative Abundance		100	606	No Fish	0	-	-	-	-	-
T14N R7E Sec17										
	7/29/04									
(Belt)										
Horn Cr., Lower, Genetics/Relative Abundance		275	2297	WCT	10	96	186	156	3.6	15.7
T14N R7E Sec8										
	7/21/04									
(Belt)										
Horn Cr., Upper Trib., Relative Abundance		-	1235	No Fish	0	-	-	-	-	-
T14N R7E Sec16										
	7/29/04									
(Belt)										
Jumping Cr., Sec. 1, Relative Abundance		75	893	EB	42	40	215	110	56.0	169.3
T12N R8E Sec30										
	9/8/04									
(Smith)										
Jumping Cr., Sec. 2, Relative Abundance		75	835	EB	28	40	185	113	37.3	120.7
T12N R8E Sec19										
	9/8/04									
(Smith)										
Jumping Cr., Sec. 3, Relative Abundance		75	1317	EB	56	60	210	133	74.7	153.1

Sampling Site	Date	Length (m)	Seconds Sampled	Species	N	Total Length (mm) Min	Total Length (mm) Max	Total Length (mm) Avg	CPUE (m) 100	CPUE (hr) 1
T12N R8E Sec19										
	9/8/04									
(Smith)										
Jumping Cr., Sec. 4, Relative Abundance		75	907	EB	12	80	170	125	16.0	47.6
T12N R8E Sec18										
	9/8/04									
(Smith)										
Jumping Cr., Sec. 5, Genetics/Relative Abundance		75	870	WCT	10	110	160	138	4.0	12.4
T12N R8E Sec17		75	870	EB	6	30	150	84	8.0	24.8
	9/8/04									
(Smith)										
Jumping Cr., Sec. 6, Genetics/Relative Abundance		180	-	WCT	16	36	201	139	9.0	-
T12N R8E Sec8,17		180	-	EB	19	48	226	140	11.0	-
	9/9/04									
(Smith)										
Judith River, Lost Fk., Relative Abundance		131	-	RBT	13	99	163	132	9.9	-
T12N R11E Sec6				EB	24	58	292	145	18.3	-
	9/27/04									
(Judith)										
Judith River, Mid. Fk., Population Estimate		300	-	WCT	1	203	203	203	0.3	-
T13N R11E Sec33		300	-	RBT	44	46	310	150	14.7	-
	9/27/04	300	-	EB	25	18	229	122	8.3	-
(Judith)										
Judith River, S. Fk., Bluff Mountain, Population Estimate		175	-	HYB	4	84	216	152	2.3	-
T12N R11E Sec4		175	-	RBT	122	41	221	132	69.7	-
	10/26/04	175	-	EB	2	76	152	114	1.1	-
(Judith)				WH	4	221	290	262	2.3	-
Judith River, S. Fk., Below Dry Pole, Population Estimate		199	-	HYB	8	170	249	206	4.0	-
T12N R11E Sec23		199		RBT	115	48	285	119	57.7	-
	10/14/04	199		EB	3	94	203	145	1.5	-
(Judith)		199	-	WH	52	69	259	122	26.1	-
		199	-	LNS	2	191	198	193	1.0	-
Lake Creek, Lower, Population Estimate		100	795	HYB	11	58	188	114	11.0	49.8
T 11N R7E Sec25										
	6/24/04									
(Smith)										

Sampling Site	Date	Length (m)	Seconds Sampled	Species	N	Min	Total Length (mm) Max	Avg	CPUE (m) 100	CPUE (hr) 1
Lonesome Cr., Relative Abundance T28N R11W Sec5&6 (Two Medicine)	8/31/04	300	3471	WCT	9	79	250	172	3.0	9.3
Lyons Gulch, Lower, Relative Abundance T14N R10E Sec18 (Judith)	8/5/04	100	1248	EB	18	39	195	116	18.0	51.9
Lyons Gulch, Upper, Relative Abundance T14N R10E Sec18 (Belt)	8/5/04	90	310	WCT	3	123	160	138	3.3	34.8
		90	310	EB	9	67	150	102	10.0	104.5
Little Belt Cr., M. Fk., Sec. 1, Suppression T19N R9E Sec18 (Belt)	7/14/04	500	-	WCT	21	110	152	129	4.2	-
		500	-	EB	29	40	188	103	5.8	-
Little Belt Cr., M. Fk., Sec. 2, Suppression T19N R9E Sec18 (Belt)	7/28/04	-	6705	WCT	88	66	258	135	-	47.2
		-	6705	EB	6	50	203	152	-	3.2
Little Belt Cr., M. Fk., Sec. 3, Suppression T19N R9E Sec18 (Belt)	7/28/04	-	2573	WCT	9	115	174	140	-	12.6
		-	2573	EB	1	124	124	124	-	1.4
Little Belt Cr., M. Fk., Sec. 4, Suppression T19N R9E Sec18 (Belt)	7/28/04	-	4275	WCT	55	62	195	117	-	46.3
Oti Park Cr., Sec. 1, Suppression T15N R9E Sec32 (Belt)	7/26/04	-	6322	WCT	66	41	225	124	-	37.6
		-	6322	EB	29	39	238	139	-	16.5
Oti Park Cr., Sec. 2, Suppression T15N R9E Sec32 (Belt)	7/26/04	400	5337	WCT	96	57	222	122	24.0	64.8
		400	5337	EB	75	84	210	133	18.8	50.6

Sampling Site	Date	Length (m)	Seconds Sampled	Species	N	Min	Total Length (mm) Max	Avg	CPUE (m) 100	CPUE (hr) 1
Oti Park Cr., Genetics/Suppression T15N R9E Sec31 (Belt)	8/6/04	140	1790	WCT	20	69	207	149	14.3	40.2
		140	1790	EB	22	46	198	138	15.7	44.2
Oti Park Cr., Sec. 3, Suppression T15N R9E Sec31 (Belt)	8/13/04	210	3494	WCT	85	39	228	123	40.5	87.6
		210	3494	EB	48	79	187	121	22.9	49.5
Oti Park Cr., Sec. 4, Suppression T15N R9E Sec31 (Belt)	9/28/04	100	3362	WCT	51	69	121	100	51.0	54.6
		100	3362	EB	53	71	196	118	53.0	56.8
Petty Cr., Transfer Site, Population Estimate T19N R9W Sec24 (Sun)	8/20/04	125	1386	WCT	9	101	224	170	7.2	23.4
Pole Cr., Sec. 1, Relative Abundance/Suppression T15N R1E Sec35 (Smith)	6/9/04	500	1900	No Fish	0	-	-	-	-	-
Pole Cr., Sec. 2, Relative Abundance/Suppression T15N R1E Sec35 (Smith)	6/14/04	600	10772	EB	6	190	220	203	1.0	2.0
Pole Cr., Sec. 2&3, Relative Abundance/Suppression T15N R1E Sec26 (Smith)	6/28/04	800	4200	EB	4	220	250	233	0.5	3.4
Pole Cr., Sec. 4, Relative Abundance/Suppression T15N R1E Sec26 (Smith)	7/6/04	200	-	EB	1	200	200	200	0.5	-
Richardson Cr., Lower, Genetics/Relative Abundance T9N R8E Sec21 (Smith)	7/22/04	-	-	WCT	13	95	174	151	-	-

Sampling Site	Date	Length (m)	Seconds Sampled	Species	N	Min	Total Length (mm) Max	Avg	CPUE (m) 100	CPUE (hr) 1
Richardson Cr., Upper, Relative Abundance T9N R8E Sec21 (Smith)	7/22/04	500	2034	WCT	7	100	150	121	1.4	12.4
Running Wolf Cr., S. Fk., Presence/Absence T 14N R 10E Sec14 (Judith)	8/5/04	Standing water	-	No Fish	-	-	-	-	-	-
Running Wolf Cr., N. Fk., Relative Abundance T 14N R 10E Sec16 (Judith)	10/13/04	-	-	WCT	42	41	201	109	-	-
Shorty Cr., Presence/Absence T 13N R 8E Sec 5&6 (Belt)	7/20/04	1000	1500	WCT	-	-	-	-	-	-
Shorty Cr., Relative Abundance T 13N R 8E Sec6 (Belt)	7/20/04	100	442	WCT	4	138	198	165	4.0	32.6
Shorty Cr., Upper, Relative Abundance T 13N R 8E Sec6&7 (Belt)	7/8/04	1500	3600	WCT	0	0	0	-	0.0	0.0
Slough Cr., Top of Drainage, Relative Abundance T9N R3E sec23 (Smith)	9/14/04	-	398	EB	3	130	220	187	-	27.1
Teton River, Near Forest Boundary, Relative Abundance		1300	-	WCT	8	125	419	317	0.6	-
T24N R8E Sec36		1300	-	RBT	2	280	318	299	0.2	-
	10/7/04	1300	-	EB	3	150	180	162	0.2	-
(Teton)		1300	-	LL	1	353	353	353	0.1	-
		1300	-	WTF	1	437	437	437	0.1	-
Tillinghast Cr., Near Wilson Cr., Genetics/Relative Abundance		75	509	WCT	14	141	278	196	18.7	99.0

Sampling Site	Date	Length (m)	Seconds Sampled	Species	N	Min	Total Length (mm) Max	Avg	CPUE (m) 100	CPUE (hr) 1
T14N R7E Sec16		75	509	EB	18	114	223	175	24.0	127.3
	7/19/04									
(Belt)										
Tillinghast Cr., Upstream Wilson Cr., Genetics/Relative Abundance		70	563	WCT	10	120	241	174	14.3	63.9
T14N R7E Sec21		70	563	EB	3	105	175	143	4.3	19.2
	7/19/04									
(Belt)										
Tillinghast Cr., End of Drainage., Genetics/Relative Abundance		70	767	WCT	11	49	230	161	15.7	51.6
T14N R7E Sec28										
	7/19/04									
(Belt)										
Tyrell Cr., Sec. 1-8, Relative Abundance		8000	-	No Fish	0	0	0	-	0.0	-
T15N R1W sec34,35 - T14N R1W sec3,10,9,16										
	6/09/04-6/23/04									
(Smith)										
Wilson Cr., Lower, Relative Abundance		100	693	WCT	1	165	165	165	1.0	5.2
T14N R7E Sec21		100	693	EB	10	106	213	159	10.0	51.9
	7/19/04									
(Belt)										
Wilson Cr., Mid., Genetics/Relative Abundance		209	703	WCT	7	189	235	209	3.3	35.8
T14N R7E Sec20		209	703	EB	12	109	180	157	5.7	61.5
	7/19/04									
(Belt)										

Appendix 8. Results of Region 4 genetics testing results received in 2004/2005. Samples were collected by MFWP, USFS and USFWS.

Stream	Drainage	Legal	# Fish	Date Collected	Date Reported	Test	Results
Crawford Cr.	Belt	T14N R 7E Sec 11	15	6/11/2003	5/26/2004	PCR	100%
Crawford Cr.	Belt	T14N R 7E Sec 11	25	6/11/2003	5/26/2004	PCR	100% and mixed (10)
Harley Cr.	Belt	T 14N R 7E Sec 25	25	6/25/2003	12/3/2004	PCR	98% WCT x 2% RB
Palisades	Belt	T 13N R 19E Sec 13	10	6/19/2003	1/11/2005	PCR	100% WCT
Deadhorse Cr., Trib.	Judith	T 11N R 10E Sec 13	18	6/13/2003	12/3/2004	PCR	<100% WCT
Harrison Cr., Trib.	Judith	T 12N R 9E Sec 17	26	8/6/2003	12/3/2004	PCR	<100% WCT
Judith R., S. Fk.	Judith	T 11N R 11E Sec 4	25	6/23/2003	3/8/2004	Alloz.	Mostly rainbow
Judith R., S. Fk.	Judith	T 11N R 11E Sec 18	25	6/23/2003	3/8/2004	Alloz.	Mostly hybrid WCT
Jumping Cr.	Smith	T 12N R 8E Sec 17	15	9/8/2004	12/3/2004	PCR	100% WCT
Tenderfoot Cr., S. Fk.	Smith	T 13N R 5E Sec 4	15/20	8/21/2003	3/22/2004	PCR	96% WCT
Dupuyer Cr., N. Fk.	Two Medicine	T 27N R 9W Sec 29	25	7/16/2003	1/11/2005	PCR	92% WCT x 8% RB
Dupuyer Cr., M. Fk.	Two Medicine	T 27N R 9W Sec 26	7	7/21/2003	1/11/2005	PCR	100% WCT
Dupuyer Cr., S. Fk., Lower	Two Medicine	T 27N R 9W Sec 35	25	7/22/2003	12/3/2004	PCR	87% WCT x 5% RB x 8% YCT
Dupuyer Cr., S. Fk., Upper	Two Medicine	T 26N R 9W Sec 30	25	7/22/2003	12/3/2004	PCR	100% WCT
Lost Shirt Cr.	Two Medicine	T 29N R 12W Sec 19	10	8/14/2002	12/3/2004	PCR	93% WCT x 7% RB
Midvale Creek	Two Medicine	T 31N R 13W Sec 14	25	9/24/2002	03/22/2004	PCR	100% WCT

RB = Rainbow trout; YCT = Yellowstone cutthroat trout; WCT = Westslope cutthroat trout

Appendix 9. Genetic samples taken by MFWP and USFS personnel in 2004.

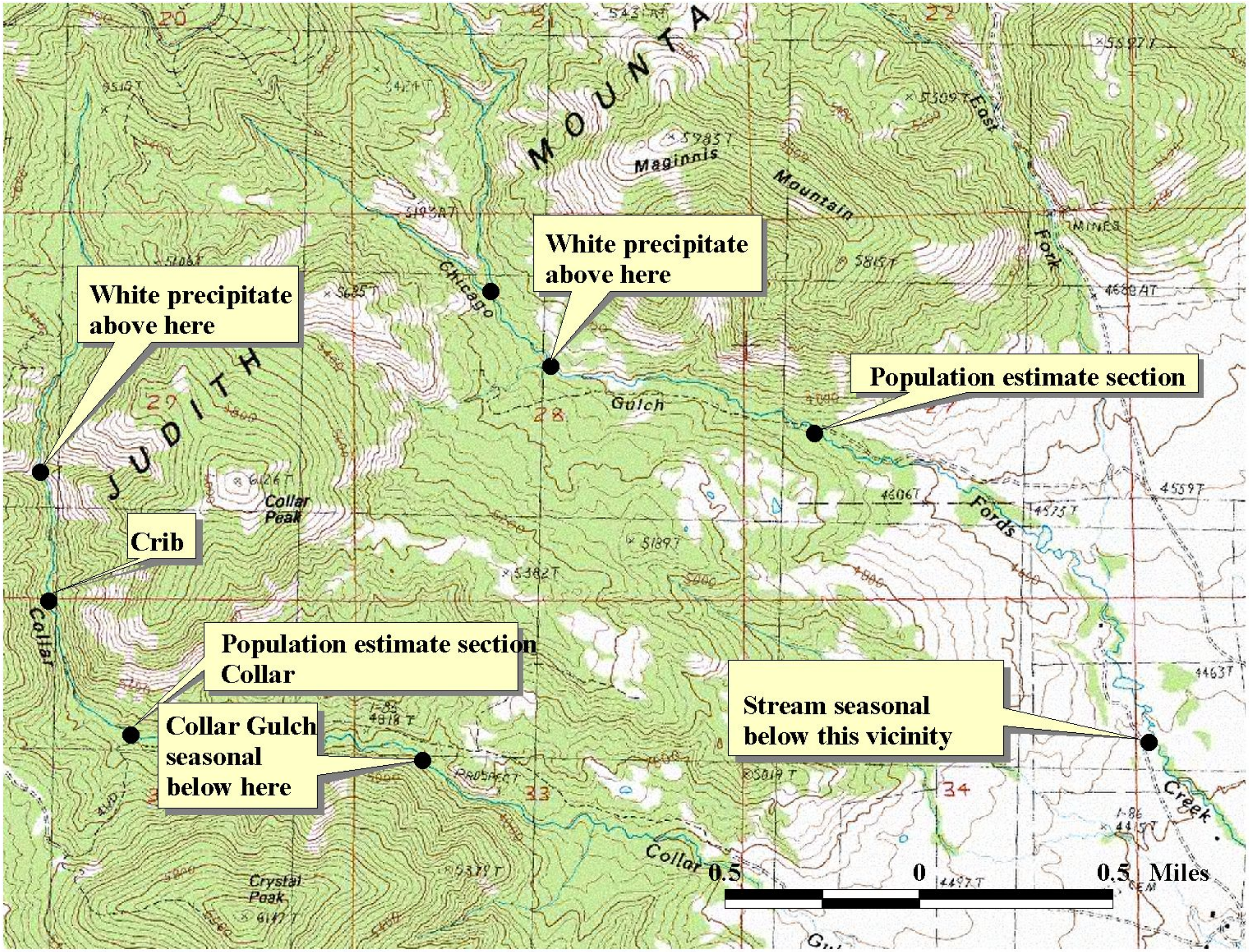
Stream	Drainage	Legal	# Fish	Date Collected	Test
Boyd Cr.	Arrow	T 20N R 10E Sec 32	25	10/20/2004	PCR
Horn Cr., Lower	Belt	T 14N R 7E Sec 8	10	7/21/2004	PCR
Oti Park Cr.	Belt	T 15N R 9E Sec 31	20	8/6/2004	PCR
Tillinghast Cr., Near Wilson	Belt	T 14N R 7E Sec 16	12	7/19/2004	PCR
Tillinghast Cr., Upstream Wilson	Belt	T 14N R 7E Sec 21	10	7/19/2004	PCR
Tillinghast Cr., End of Drainage	Belt	T 14N R 7E Sec 28	10	7/19/2004	PCR
Wilson Cr., Middle	Belt	T 14N R 7E Sec 20	7	7/19/2004	PCR
Big Spring Cr., E. Fk.	Judith	T 12N R 19E Sec 9	125	8/2/2004	DNA
Jumping Cr.	Smith	T 12N R 8E Sec 17	25	9/8/2004	PCR
Richardson Cr.	Smith	T 9N R 8E Sec 21	13	7/22/2004	PCR
French Cr., Upper	Smith	T 12N R 1E Sec 15	25	9/13/2004	PCR
Three Mile Cr.	Upper Missouri	T 11N R 5W Sec 24	18	7/1/2004	PCR

Appendix 10. Specific conductance and temperature for streams sampled in 2003. Samples were collected by MFWP and the USFS.

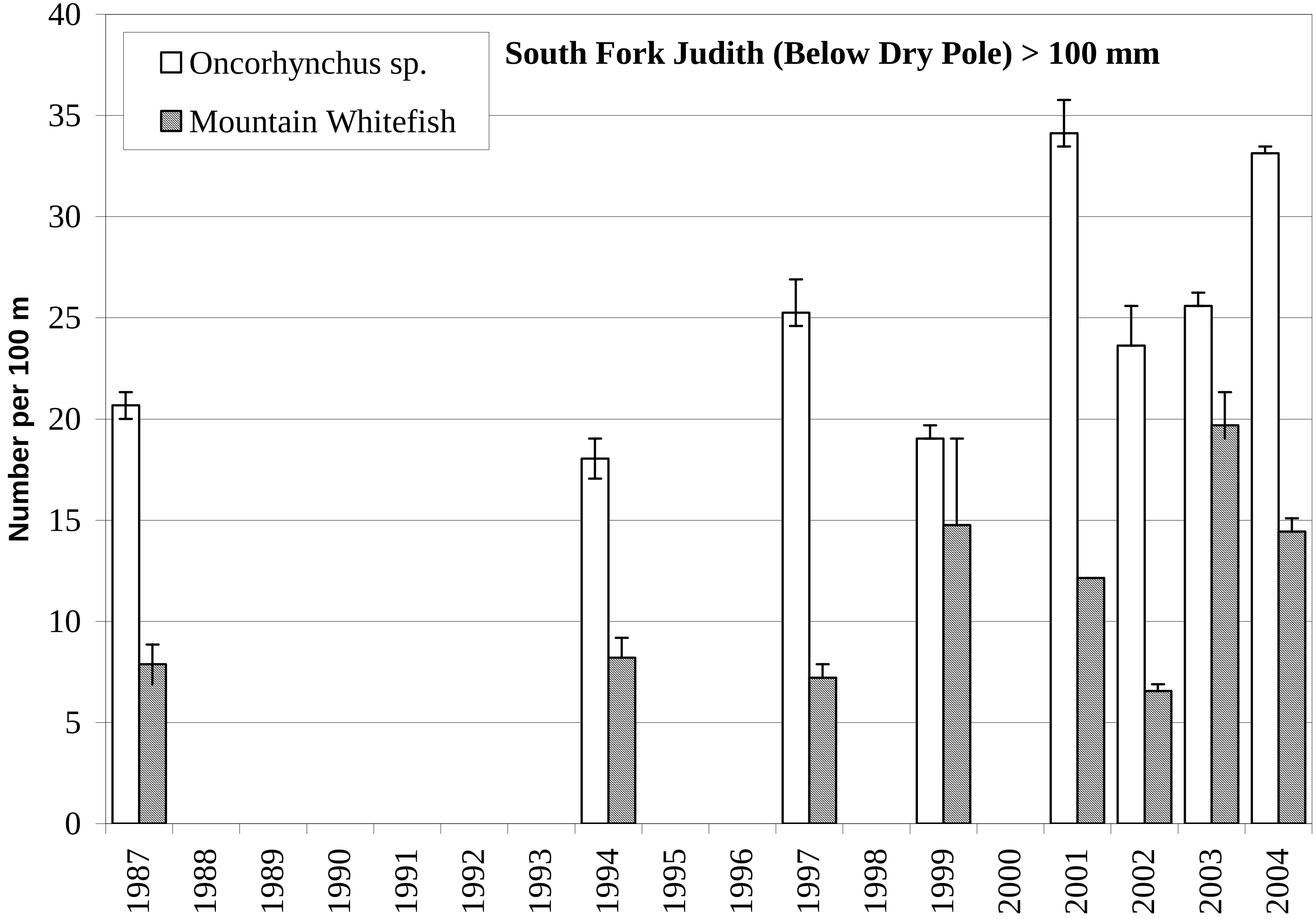
Stream	Drainage	Date	Cond. (*u*S)	Temp. C
Boyd Cr., Genetics/Relative Abundance	(Arrow)	10/20/04	250	5
Cottonwood Cr., Sec. 1, Suppression/Population Estimate	(Arrow)	8/16/04	117	12
Cottonwood Cr., Sec. 2, Suppression/Population Estimate	(Arrow)	8/16/04	117	12
Cottonwood Cr., Sec. 3, Suppression/Population Estimate	(Arrow)	8/16/04	117	12
Cottonwood Cr., Sec. 4, Suppression/Population Estimate	(Arrow)	8/17/04	100	14
Cottonwood Cr., Sec. 5, Suppression/Population Estimate	(Arrow)	8/17/04	100	14
Cottonwood Cr., Sec. 6, Suppression/Population Estimate	(Arrow)	8/17/04	100	14
Cottonwood Cr., Sec. 7, Suppression/Population Estimate	(Arrow)	8/17/04	100	14
Cottonwood Cr., Sec. 9, Suppression/Population Estimate	(Arrow)	8/18/04	133	13
Cottonwood Cr., Sec. 10, Suppression/Population Estimate	(Arrow)	8/18/04	117	12
Cottonwood Cr., Sec. 11, Suppression/Population Estimate	(Arrow)	8/18/04	160	13
Cottonwood Cr., Sec. 12, Suppression/Population Estimate	(Arrow)	8/18/04	130	13
Cottonwood Cr., Sec. 13, Suppression/Population Estimate	(Arrow)	8/19/04	133	12
Cottonwood Cr., Sec. 15, Suppression/Population Estimate	(Arrow)	10/19/04	170	2
Cottonwood Cr., Trib., Suppression/Relative Abundance	(Arrow)	8/16/04	80	12
Chamberlain Cr., Lower, Population Estimate	(Belt)	7/27/04	120	10
Chamberlain Cr., Upper, Population Estimate	(Belt)	7/27/04	83	8
Gold Run Cr., Expansion Sec., Relative Abundance	(Belt)	9/21/04	480	3
Horn Cr., Mid, Relative Abundance	(Belt)	7/29/04	70	6
Horn Cr., Upper, Relative Abundance	(Belt)	7/29/04	70	6
Horn Cr., Lower, Genetics/Relative Abundance	(Belt)	7/21/04	67	8
Horn Cr., Upper Trib., Relative Abundance	(Belt)	7/29/04	117	6
Jumping Cr., Sec. 5, Genetics/Relative Abundance	(Belt)	9/8/04	180	8
Little Belt Cr., M. Fk., Sec. 1, Suppression	(Belt)	7/14/04	133	12
Little Belt Cr., M. Fk., Sec. 2, Suppression	(Belt)	7/28/04	133	8
Little Belt Cr., M. Fk., Sec. 3, Suppression	(Belt)	7/28/04	133	8
Little Belt Cr., M. Fk., Sec. 4, Suppression	(Belt)	7/28/04	150	9
Oti Park Cr., Sec. 1, Suppression	(Belt)	7/26/04	67	13
Oti Park Cr., Sec. 2, Suppression	(Belt)	7/26/04	70	16
Oti Park Cr., Genetics/Suppression	(Belt)	8/6/04	50	13
Oti Park Cr., Sec. 3, Suppression	(Belt)	8/13/04	67	9
Oti Park Cr., Sec. 4, Suppression	(Belt)	9/28/04	100	4
Shorty Cr., Presence/Absence	(Belt)	7/20/04	30	10
Shorty Cr., Relative Abundance	(Belt)	7/20/04	30	10
Shorty Cr., Upper, Relative Abundance	(Belt)	7/8/04	0	9
Tillinghast Cr., Near Wilson Cr., Genetics/Relative Abundance	(Belt)	7/19/04	50	13
Wilson Cr., Lower, Relative Abundance	(Belt)	7/19/04	53	
Wilson Cr., Mid., Genetics/Relative Abundance	(Belt)	7/19/04	83	8
Big Coulee, Tributary, Mark - Movement	(Highwood)	7/12/04	200	10
Big Coulee, Below New Barrier, Mark - Movement	(Highwood)	7/12/04	150	11
Big Coulee Cr., Barrier to Campsite, Sec. 1, Suppression	(Highwood)	7/12/04	150	11
Big Coulee, Blasted Barrier to Campsite, Sec. 1, Suppression	(Highwood)	8/30/04	150	12
Big Coulee, Sec. 2, Suppression	(Highwood)	8/31/04	133	10
Big Coulee, Sec. 3, Suppression	(Highwood)	9/1/04	83	11
Big Coulee, Sec. 4, Suppression	(Highwood)	9/1/04	90	11
Big Coulee, Sec. 5, Suppression	(Highwood)	9/2/04	90	8

Stream	Drainage	Date	Cond. (*u*S)	Temp. C
Cottonwood Cr., Snowies, Transfer	(Judith)	9/22/04	250	6
Big Camas Cr., Sec. 1, Relative Abundance	(Smith)	9/7/04	90	8
Big Camas Cr., Sec. 2, Relative Abundance	(Smith)	9/7/04	90	8
Cottonwood Cr., E. Fk., Relative Abundance	(Smith)	7/13/04	83	12
Cottonwood Cr., W. Fk., Low, Relative Abundance	(Smith)	7/13/04	83	10
Cottonwood Cr., W. Fk., Upstream of E. Fk., Population Estimate	(Smith)	7/13/04	120	-
Cottonwood Cr., W. Fk., Population Estimate	(Smith)	7/13/04	67	-
Cottonwood Cr., W. Fk., Upstream Trib., Relative Abundance	(Smith)	7/13/04	100	12
Cottonwood Cr., W. Fk., Forest Boundary, Population Estimate	(Smith)	7/13/04	150	13
Daniels Cr., Lower, Relative Abundance	(Smith)	9/23/04	90	7
French Cr., Lower, Relative Abundance	(Smith)	9/13/04	120	8
French Cr., Upper, Relative Abundance	(Smith)	9/13/04	110	7
Jumping Cr., Sec. 1, Relative Abundance	(Smith)	9/8/04	310	7
Jumping Cr., Sec. 2, Relative Abundance	(Smith)	9/8/04	240	7
Jumping Cr., Sec. 3, Relative Abundance	(Smith)	9/8/04	190	11
Jumping Cr., Sec. 4, Relative Abundance	(Smith)	9/8/04	210	7
Lake Creek, Lower, Population Estimate	(Smith)	6/24/04	460	8
Pole Cr., Sec. 2, Relative Abundance/Suppression	(Smith)	6/14/04	210	15
Pole Cr., Sec. 2&3, Relative Abundance/Suppression	(Smith)	6/28/04	210	17
Pole Cr., Sec. 4, Relative Abundance/Suppression	(Smith)	7/6/04	220	16
Richardson Cr., Lower, Genetics/Relative Abundance	(Smith)	7/22/04	33	12
Richardson Cr., Upper, Relative Abundance	(Smith)	7/22/04	30	16
Slough Cr., Top of Drainage, Relative Abundance	(Smith)	9/14/04	480	7
Tyrell Cr., Sec. 1-8, Relative Abundance	(Smith)	6/09/04-6/23/04	313	13
Petty Cr., Transfer Site, Population Estimate	(Sun)	8/20/04	280	6
Teton River., Near Forest Boundary, Relative Abundance	(Teton)	10/7/04	390	9
Lonesome Cr., Relative Abundance	(Two Medicine)	8/31/04	290	7

*TDS (Total Dissolved Solids) measurements collected in the field were converted to specific conductance using the formula Cond. = TDS/0.6



Appendix 11. Location and description of sampling sections, Collar and Chicago Gulch, 2004.



Appendix 12. Population estimates on the South Fork Judith River below Dry Pole Creek for fish > 100 mm total length.